



HUBBLE SCIENCE

BLACK HOLES From Myth to Reality

1
00:00:16,470 --> 00:00:14,470

[Music]

2
00:00:20,550 --> 00:00:16,480

one of the hubble space telescope's

3
00:00:23,670 --> 00:00:20,560

major achievements was the confirmation

4
00:00:26,070 --> 00:00:23,680

that galaxies have

5
00:00:33,030 --> 00:00:26,080

in their core

6
00:00:37,670 --> 00:00:34,950

at least for a time were kind of a

7
00:00:40,229 --> 00:00:37,680

mythical idea you know a mathematical

8
00:00:42,869 --> 00:00:40,239

possibility coming from the physics but

9
00:00:45,190 --> 00:00:42,879

it was not clear decades ago whether we

10
00:00:46,790 --> 00:00:45,200

could actually observe a black hole

11
00:00:49,110 --> 00:00:46,800

because kind of by definition black

12
00:00:50,389 --> 00:00:49,120

holes are not viewable the light cannot

13
00:00:52,229 --> 00:00:50,399

escape

14

00:00:54,790 --> 00:00:52,239

so the question is could you observe

15

00:00:57,430 --> 00:00:54,800

effects of black holes to determine that

16

00:00:59,670 --> 00:00:57,440

they are there

17

00:01:03,270 --> 00:00:59,680

now the way hubble has detected this is

18

00:01:05,590 --> 00:01:03,280

by looking not at the black hole which

19

00:01:07,429 --> 00:01:05,600

is really impossible to see what we see

20

00:01:09,750 --> 00:01:07,439

is material right around the black hole

21

00:01:12,469 --> 00:01:09,760

particularly this galaxy called m87

22

00:01:16,390 --> 00:01:12,479

which has a spectacular ejected jet

23

00:01:21,910 --> 00:01:19,670

and often we see material orbiting that

24

00:01:24,390 --> 00:01:21,920

inner black hole like gas

25

00:01:26,789 --> 00:01:24,400

and orbiting very fast so we can use the

26
00:01:28,550 --> 00:01:26,799
instruments on hubble to discern whether

27
00:01:30,310 --> 00:01:28,560
material on one side of the black hole

28
00:01:32,149 --> 00:01:30,320
is moving away from us and the material

29
00:01:33,749 --> 00:01:32,159
on the other side is moving toward us as

30
00:01:36,700 --> 00:01:33,759
you might expect if the material is

31
00:01:41,429 --> 00:01:36,710
orbiting

32
00:01:46,469 --> 00:01:43,749
since that time hubble has followed up

33
00:01:48,789 --> 00:01:46,479
with many other galaxies and seen

34
00:01:50,870 --> 00:01:48,799
evidence for supermassive black holes so

35
00:01:53,030 --> 00:01:50,880
we now believe that most and maybe all

36
00:01:56,460 --> 00:01:53,040
galaxies have some kind of supermassive

37
00:02:01,910 --> 00:01:56,470
black hole in the center

38
00:02:05,429 --> 00:02:03,350

people did not dream that that would be

39

00:02:07,510 --> 00:02:05,439

true it wasn't that long ago that people

40

00:02:09,350 --> 00:02:07,520

thought there were no black holes then

41

00:02:10,790 --> 00:02:09,360

we thought well we don't imagine how

42

00:02:12,710 --> 00:02:10,800

they could exist so there probably

43

00:02:14,790 --> 00:02:12,720

aren't any and now we are forced into

44

00:02:18,240 --> 00:02:14,800

understanding how come there are so many