1
00:00:12,060 --> 00:00:10,040
Music

2
00:00:12,080 --> 00:00:16,100
Narrator: Most big galaxies contain big black holes. Not just big,

3
00:00:16,120 --> 00:00:20,160
supersized, with millions of times the sun's mass

4
00:00:20,180 --> 00:00:24,190
Some of these black holes are actively devouring gas. This drives

5
00:00:24,210 --> 00:00:28,280
particle jets that can spew matter millions of light-years into space, and it

6
00:00:28,300 --> 00:00:32,430
also makes the holes a source of penetrating, or hard, X-rays.

7
00:00:32,450 --> 00:00:36,460
At these energies, the sky glows in every direction, even far away

8
00:00:36,480 --> 00:00:40,500
from bright sources. Astronomers have long suspected that active

9
00:00:40,520 --> 00:00:44,550
supermassive black holes in galaxies were responsible, but they just couldn't find

10
00:00:44,570 --> 00:00:48,560
enough of them to account for the X-ray glow--especially the peak of the energy spectrum.

11
00:00:48,580 --> 00:00:52,610
Now, astronomers using NASA's

12
00:00:52,630 --> 00:00:56,680
Swift satellite confirm that a largely unseen population of black-hole-powered

13
00:00:56,700 --> 00:01:00,710

galaxies is out there. There are so many that scientists say they might fully

14
00:01:00,730 --> 00:01:04,750
account for the cosmic X-ray background. What emission we

15
00:01:04,770 --> 00:01:08,830
detect from an active black hole is a function of how we see it--whether we're looking

16
00:01:08,850 --> 00:01:12,860
face-on and into one of it's jets, or viewing it from the side, through the disk of gas

17
00:01:12,880 --> 00:01:16,900
and dust that surrounds it. The brightest active black

18
00:01:16,920 --> 00:01:20,980
holes, which include quasars and blazars, are those we see face-on.

19
00:01:21,000 --> 00:01:25,010
But as the viewing angle increases, the surrounding disk absorbs increasing

20
00:01:25,030 --> 00:01:29,070
amounts of radiation. Astronomers have always assumed that many

21
00:01:29,090 --> 00:01:33,090
active galaxies were oriented edgewise to us, but because the disk of gas

22
00:01:33,110 --> 00:01:37,110
smothers most of their X-rays, these sideways black holes just weren't detected.

23
00:01:37,130 --> 00:01:41,160
And that's where Swift comes in. Since

24
00:01:41,180 --> 00:01:45,180
2004, the satellites Burst Alert Telescope has been building up the largest, most

25
00:01:45,200 --> 00:01:49,210
sensitive X-ray map of the sky. Using these data,

26
00:01:49,230 --> 00:01:53,260
astronomers found that the most heavily absorbed galaxies create the energy peak in the

27
00:01:53,280 --> 00:01:57,260
cosmic X-ray background. What does it all mean?

28
00:01:57,280 --> 00:02:01,300
When the universe was about half its present age, about 7 billion years ago, galaxies

29
00:02:01,320 --> 00:02:05,370
crashed together more frequently and these collisions produced gas rich galaxies

30
00:02:05,390 --> 00:02:09,370
with heavily obscured black holes. The Swift survey shows that

31
00:02:09,390 --> 00:02:13,410
galaxy mergers helped activate these black holes by feeding them torrents of fresh gas.

32
00:02:13,430 --> 00:02:17,490
The new findings are consistent with idea that the X-ray background

33
00:02:17,510 --> 00:02:21,500
peaked around this time, when our own galaxy was young and before our