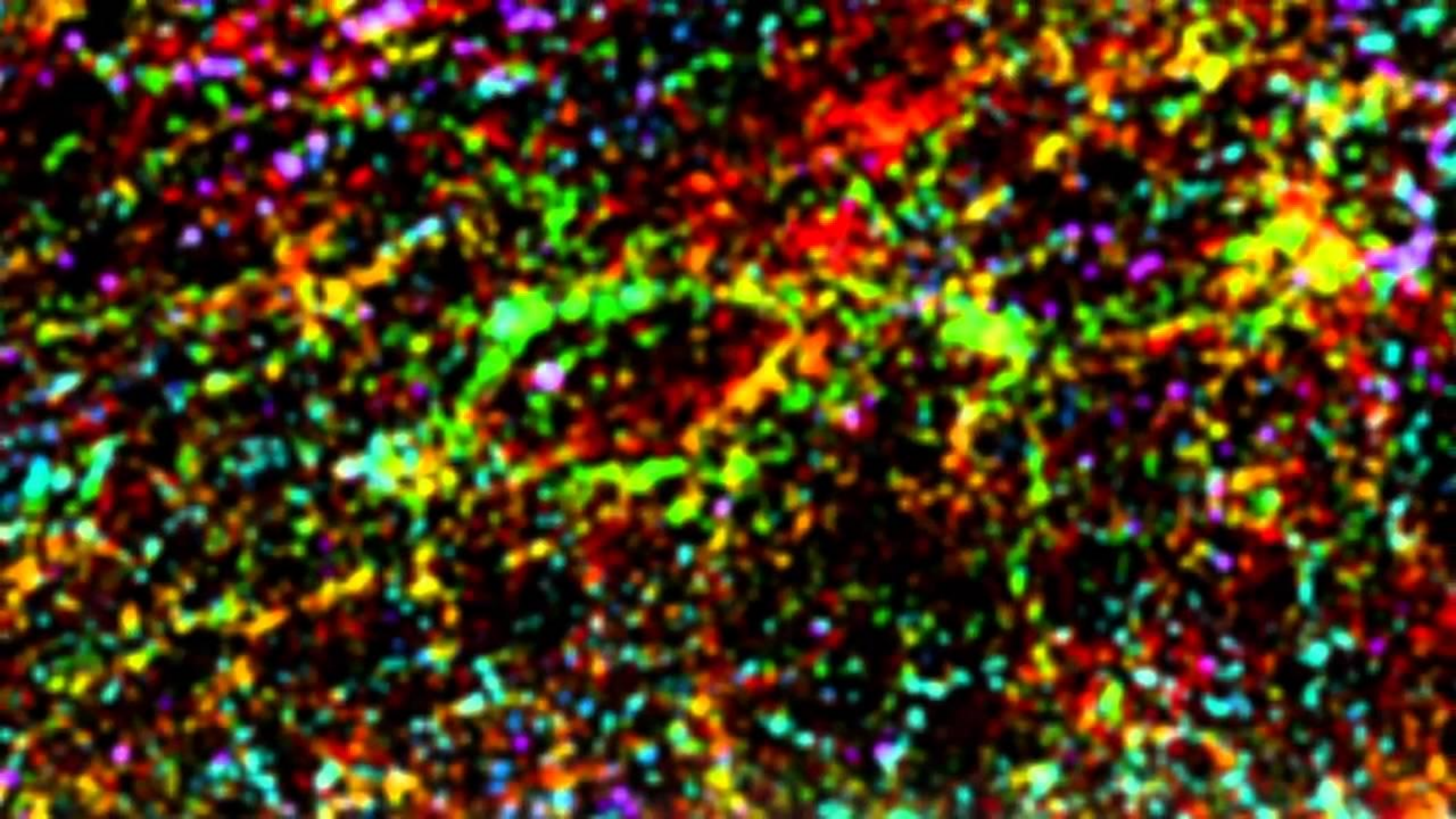

1
00:00:18,290 --> 00:00:14,419
galaxies once were regarded as Island

2
00:00:20,660 --> 00:00:18,300
universes isolated realms of gas dust

3
00:00:25,480 --> 00:00:20,670
and billions of stars that were

4
00:00:28,670 --> 00:00:25,490
separated by distances unimaginably fast

5
00:00:31,640 --> 00:00:28,680
but no galaxy is an island in fact

6
00:00:34,160 --> 00:00:31,650
galaxies prefer company the

7
00:00:36,770 --> 00:00:34,170
gravitational pull of a large massive

8
00:00:39,889 --> 00:00:36,780
galaxy attracts like sized and smaller

9
00:00:43,160 --> 00:00:39,899
neighbors galaxies may gather and modest

10
00:00:46,100 --> 00:00:43,170
groupings like these or congregate by

11
00:00:49,729 --> 00:00:46,110
the hundreds in enormous clusters this

12
00:00:53,240 --> 00:00:49,739
is a Bill 1689 one of the largest galaxy

13
00:00:55,459 --> 00:00:53,250

clusters known this view spans some two

14
00:00:57,170 --> 00:00:55,469
million light-years or about the

15
00:01:01,069 --> 00:00:57,180
distance between our Milky Way galaxy

16
00:01:04,910 --> 00:01:01,079
and the nearest big spiral into the

17
00:01:08,600 --> 00:01:04,920
space Abell 1689 packs more than 500

18
00:01:11,149 --> 00:01:08,610
galaxies as astronomers mapped nearby

19
00:01:15,380 --> 00:01:11,159
galaxy clusters a more complete picture

20
00:01:17,649 --> 00:01:15,390
of cosmic structure emerged galaxy

21
00:01:20,450 --> 00:01:17,659
clusters gather in super clusters and

22
00:01:23,359 --> 00:01:20,460
overlapping super clusters form chains

23
00:01:29,899 --> 00:01:23,369
and filaments spanning huge swaths of

24
00:01:32,840 --> 00:01:29,909
the sky welcome to the cosmic web this

25
00:01:35,710 --> 00:01:32,850
all-sky map shows structures created by

26
00:01:38,480 --> 00:01:35,720
more than a million nearby galaxies

27
00:01:41,510 --> 00:01:38,490
deeper studies show that this pattern

28
00:01:44,179 --> 00:01:41,520
continues to even greater distances the

29
00:01:50,749 --> 00:01:44,189
cosmic web appears to be the backbone of

30
00:01:55,730 --> 00:01:50,759
our universe the universe came into

31
00:01:57,770 --> 00:01:55,740
being 13.7 billion years ago about four

32
00:02:00,289 --> 00:01:57,780
hundred thousand years later it had

33
00:02:03,080 --> 00:02:00,299
cooled enough to form the first animals

34
00:02:05,539 --> 00:02:03,090
the event created a sudden

35
00:02:07,690 --> 00:02:05,549
like that astronomers now measure as the

36
00:02:11,420 --> 00:02:07,700
Cosmic Microwave Background

37
00:02:15,550 --> 00:02:11,430
but then the universe went dark

38
00:02:18,199 --> 00:02:15,560

for millions of years eventually

39
00:02:22,789 --> 00:02:18,209
hydrogen gas cooled enough to collapse

40
00:02:25,070 --> 00:02:22,799
and form the first stars these stars not

41
00:02:27,740 --> 00:02:25,080
only really manator the universe they

42
00:02:30,759 --> 00:02:27,750
became the seeds of all future cosmic

43
00:02:34,369 --> 00:02:30,769
structure the James Webb Space Telescope

44
00:02:38,809 --> 00:02:34,379
may be able to see clusters of these

45
00:02:43,210 --> 00:02:38,819
first stars it may even catch a few of

46
00:02:46,220 --> 00:02:43,220
them dying in supernova explosions

47
00:02:49,490 --> 00:02:46,230
either the first stars or their progeny

48
00:02:52,789 --> 00:02:49,500
gathered into the first galaxies these

49
00:02:55,190 --> 00:02:52,799
were small gas rich dwarfs nothing as

50
00:02:57,680 --> 00:02:55,200
grand as the big galaxies we see today

51
00:02:59,950 --> 00:02:57,690
but they were the building blocks of

52
00:03:03,490 --> 00:02:59,960
modern galaxies

53
00:03:07,120 --> 00:03:03,500
as the dwarf galaxies form collide and

54
00:03:12,070 --> 00:03:07,130
merge into bigger galaxies the cosmic

55
00:03:14,860 --> 00:03:12,080
web begins to take shape with the James

56
00:03:16,660 --> 00:03:14,870
Webb Space Telescope astronomers will

57
00:03:19,240 --> 00:03:16,670
glimpse the earliest phases of