1
00:00:08,310 --> 00:00:04,190
Sound effects

2
00:00:08,330 --> 00:00:12,350
silence

3
00:00:12,370 --> 00:00:16,400
Galaxies are the building
blocks of the universe.

4
00:00:16,420 --> 00:00:20,420
The giant galaxies we see today
— even our own — were built up

5
00:00:20,440 --> 00:00:24,560
from many smaller galaxies. But
construction isn't

6
00:00:24,580 --> 00:00:28,720
done yet. It continues even
today.

7
00:00:28,740 --> 00:00:32,900
Full-grown galaxies approach
and interact with each other.

8
00:00:32,920 --> 00:00:36,980
They may collide and eventually
merge.

9
00:00:37,000 --> 00:00:41,010
As the galaxies approach, the
tug of gravity creates tides

10
00:00:41,030 --> 00:00:45,180
that distort their shapes.

11
00:00:45,200 --> 00:00:49,330
Stars and gas stream into new

orbits.

12
00:00:49,350 --> 00:00:53,430
Sometimes, they're completely
ejected,

13
00:00:53,450 --> 00:00:57,490
trailing into the depths of
intergalactic space.

14
00:00:57,510 --> 00:01:01,540
Gas clouds compressed in the
chaos light up with intense
rounds

15
00:01:01,560 --> 00:01:05,560
of star formation. Because
stars create most of the
chemical

16
00:01:05,580 --> 00:01:09,690
elements, such episodes have a
profound effect on a galaxy's

17
00:01:09,710 --> 00:01:13,840
chemical makeup.

18
00:01:13,860 --> 00:01:17,940
This infrared image of the
entire sky shows half a billion

19
00:01:17,960 --> 00:01:22,010
stars. Most are in our galaxy.

20
00:01:22,030 --> 00:01:26,040
Some are not. These are
companion galaxies that orbit

21
00:01:26,060 --> 00:01:30,210
our Milky Way. And some are in

between.

22
00:01:30,230 --> 00:01:34,350
In 1994, astronomers

23
00:01:34,370 --> 00:01:38,470
discovered that some of these
stars actually belong to ...

24
00:01:38,490 --> 00:01:42,550
... a different galaxy. It's
called the

25
00:01:42,570 --> 00:01:46,600
Sagittarius Dwarf Elliptical,
and the Milky Way

26
00:01:46,620 --> 00:01:50,620
is tearing it apart.

27
00:01:50,640 --> 00:01:54,720
As the dwarf galaxy passes
through the Milky Way's disk,

28
00:01:54,740 --> 00:01:58,900
gravitational tides stretch the
dwarf's stars into long streams

29
00:01:58,920 --> 00:02:03,070
that wrap around the galaxy's
orbit.

30
00:02:03,090 --> 00:02:07,160
For the dwarf, it's a fatal
attraction. For the Milky Way,

31
00:02:07,180 --> 00:02:11,210
it's but one of many similar
events that shaped our home
galaxy.

32
00:02:11,230 --> 00:02:15,230
But there's something much
bigger headed our way.

33
00:02:15,250 --> 00:02:19,360
M31, the Andromeda Galaxy.

34
00:02:19,380 --> 00:02:23,510
This is no dwarf. It's the
Milky Way's biggest

35
00:02:23,530 --> 00:02:27,630
neighbor; of roughly the same
size, mass

36
00:02:27,650 --> 00:02:31,660
and type. Astronomers say

37
00:02:31,680 --> 00:02:35,680
the crash will begin about 2
billion years from now. This

38
00:02:35,700 --> 00:02:39,810
supercomputer simulation shows
how the event may unfold

39
00:02:39,830 --> 00:02:43,960
over billions of years.

40
00:02:43,980 --> 00:02:48,060
The first pass distorts the two
great spirals.

41
00:02:48,080 --> 00:02:52,150
Stars are tossed into the
intergalactic night like

42
00:02:52,170 --> 00:02:56,190

sparks thrown from a campfire.

43
00:02:56,210 --> 00:03:00,210
Our sun, complete with planets
in tow, could be similarly

44
00:03:00,230 --> 00:03:04,360
ejected. Each pass blurs the

45
00:03:04,380 --> 00:03:08,490
identities of each galaxy.

46
00:03:08,510 --> 00:03:12,580
Eventually, Andromeda and the
Milky Way will merge into a

47
00:03:12,600 --> 00:03:16,630
single entity some astronomers
call "Milkomeda."

48
00:03:16,650 --> 00:03:20,670
How did the shape, structure,
and chemical

49
00:03:20,690 --> 00:03:24,840
content of galaxies change over
the sweep of cosmic

50
00:03:24,860 --> 00:03:28,990
history? Deep surveys by the
James Webb Space

51
00:03:29,010 --> 00:03:33,130
Telescope will capture the full
panorama

52
00:03:33,150 --> 00:03:37,210
from the earliest dwarfs that
formed to the familiar galaxies
we see around

53
00:03:37,230 --> 00:03:41,240
us today.