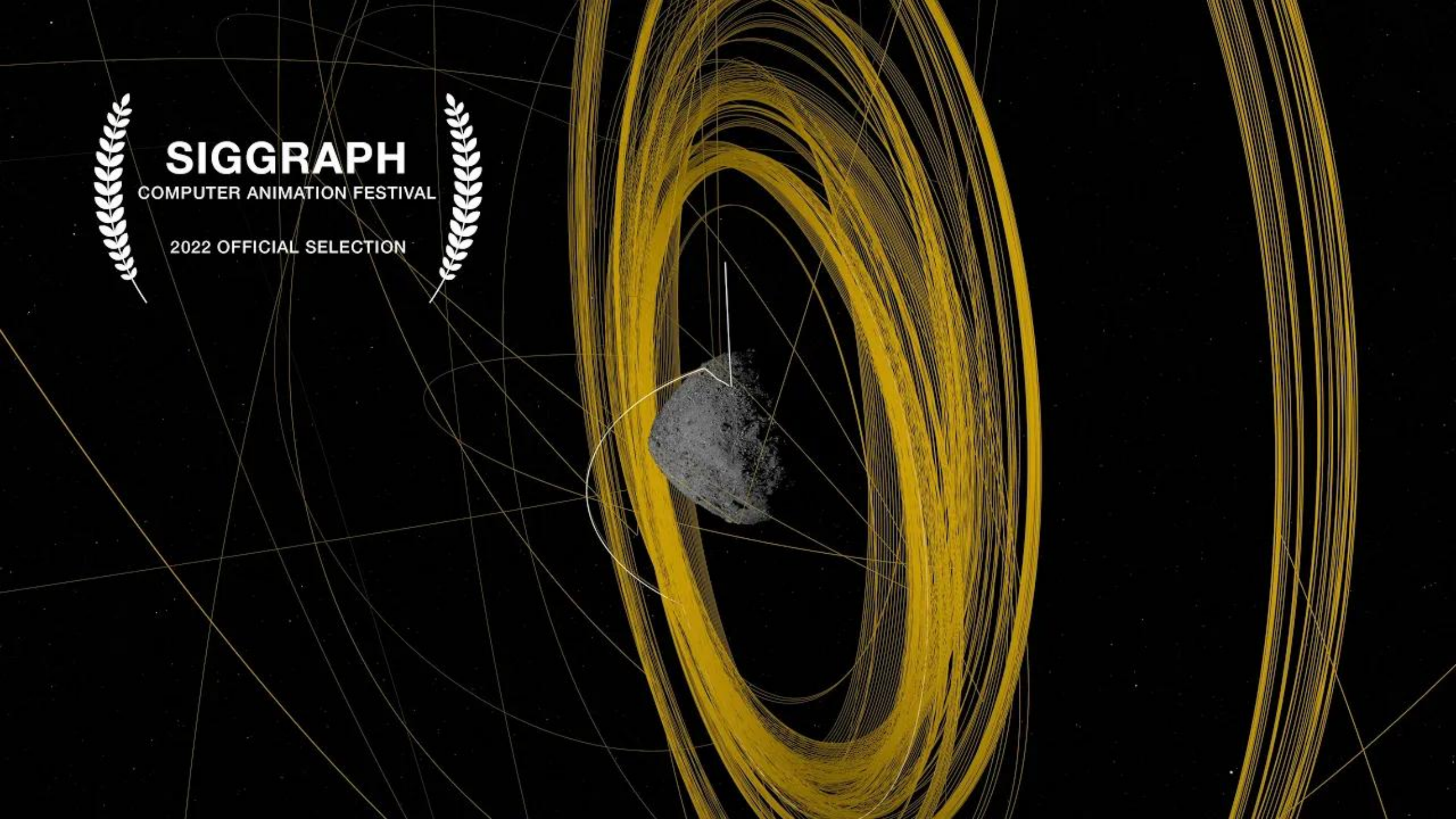
SIGGRAPH
COMPUTER ANIMATION FESTIVAL
2022 OFFICIAL SELECTION

1
00:00:00,116 --> 00:00:01,500
■■■

2
00:00:01,500 --> 00:00:03,033
This is Bennu

3
00:00:03,033 --> 00:00:05,983
one of Earth’s closest planetary neighbors

4
00:00:05,983 --> 00:00:09,266
an asteroid roughly the height of a skyscraper

5
00:00:09,266 --> 00:00:11,583
a remnant from the dawn of the solar system,

6
00:00:11,583 --> 00:00:14,533
made of carbon-rich rocks and boulders

7
00:00:14,533 --> 00:00:20,466
And since late 2018, the place that NASA’s OSIRIS-REx mission has called home.

8
00:00:20,466 --> 00:00:25,800
When OSIRIS-REx arrived, it began wrapping Bennu in a complex web of observations

9
00:00:25,800 --> 00:00:31,366
starting with a Preliminary Survey of its size, shape, mass, and spin.

10
00:00:31,366 --> 00:00:36,433
On New Year’s Eve, OSIRIS-REx was captured into orbit by Bennu’s miniscule gravity,

11
00:00:36,433 --> 00:00:40,566
making it the smallest world ever to be orbited by a spacecraft.

12
00:00:40,566 --> 00:00:44,800
In early 2019, it broke orbit to conduct a Detailed Survey.

13
00:00:44,800 --> 00:00:49,883

A series of sweeping passes allowed OSIRIS-REx to study geological features

14
00:00:49,883 --> 00:00:52,183
at different latitudes and times of day,

15
00:00:52,183 --> 00:00:56,500
enabling stereo imaging and landmark-based navigation.

16
00:00:56,500 --> 00:01:00,183
During the Detailed Survey, OSIRIS-REx globally mapped Bennu

17
00:01:00,183 --> 00:01:02,500
at only 5cm per pixel,

18
00:01:02,500 --> 00:01:07,766
the highest-resolution of any planetary body, including Earth.

19
00:01:07,766 --> 00:01:13,466
On June 12, the spacecraft entered a new orbit at an altitude of just 680 meters,

20
00:01:13,466 --> 00:01:19,800
setting another record, and establishing a home orbit for the remainder of the mission.

21
00:01:19,800 --> 00:01:24,133
In September, it began Reconnaissance on four candidate sample collection sites:

22
00:01:24,133 --> 00:01:29,583
potential locations on Bennu to touch down and collect a sample later in the mission.

23
00:01:29,583 --> 00:01:33,050
OSIRIS-REx concluded its first year at Bennu back in orbit,

24
00:01:33,050 --> 00:01:37,366
circling the asteroid’s terminator, or boundary between day and night.

25
00:01:37,366 --> 00:01:41,066
Here, outside forces acting on the spacecraft are balanced,

26
00:01:41,066 --> 00:01:44,616
allowing it to orbit within the same plane over time.

27
00:01:44,616 --> 00:01:49,000
Reconnaissance resumed in early 2020, with close flyovers of the primary

28
00:01:49,000 --> 00:01:53,483
sample collection site Nightingale, and the backup site Osprey.

29
00:01:53,483 --> 00:01:59,200
In mid-April, OSIRIS-REx performed the first of two rehearsals prior to sample collection.

30
00:01:59,200 --> 00:02:04,466
It navigated to a predetermined “Checkpoint” about 125 meters above Bennu,

31
00:02:04,466 --> 00:02:10,050
then descended to within 65 meters before backing away.

32
00:02:10,050 --> 00:02:13,633
After the Checkpoint rehearsal, OSIRIS-REx flew one final

33
00:02:13,633 --> 00:02:16,283
Reconnaissance sortie over site Osprey.

34
00:02:16,283 --> 00:02:18,650
Then, it made a series of high-altitude maneuvers

35
00:02:18,650 --> 00:02:20,666
while rebooting its onboard processor,

36
00:02:20,666 --> 00:02:24,200
and preparing for its second rehearsal of the sample collection event.

37
00:02:24,200 --> 00:02:27,216
■■■

38
00:02:27,216 --> 00:02:32,200

On August 11, OSIRIS-REx departed its home orbit and made a four-hour traverse

39
00:02:32,200 --> 00:02:36,350
to Bennu’s northern hemisphere, retracing its earlier path.

40
00:02:36,350 --> 00:02:39,616
After performing the Checkpoint engine burn to begin its descent,

41
00:02:39,616 --> 00:02:43,783
it made a second engine burn called “Matchpoint” to match Bennu’s rotation,

42
00:02:43,783 --> 00:02:48,583
before backing away at an altitude of approximately 40 meters.

43
00:02:48,583 --> 00:02:53,333
Now, the most crucial moment of the mission had arrived.

44
00:02:53,333 --> 00:02:58,633
On October 20, 2020, at approximately 11:30 am Mountain Time,

45
00:02:58,633 --> 00:03:00,783
the spacecraft departed orbit.

46
00:03:00,783 --> 00:03:04,650
A few hours before, mission controllers on Earth had sent the commands

47
00:03:04,650 --> 00:03:08,250
for the Touch-And-Go sample collection maneuver, or TAG.

48
00:03:08,250 --> 00:03:10,083
As they watched with anticipation,

49
00:03:10,083 --> 00:03:13,300
OSIRIS-REx steered itself to sample site Nightingale,

50
00:03:13,300 --> 00:03:17,766
maneuvering toward the small crater at the walking pace of a spider.

51
00:03:17,766 --> 00:03:21,300
At 4:11 pm, the mission received confirmation:

52
00:03:21,300 --> 00:03:25,600
OSIRIS-REx had touched down and collected its sample.

53
00:03:25,600 --> 00:03:30,150
Following TAG, the spacecraft drifted to a safe distance away from Bennu.

54
00:03:30,150 --> 00:03:33,166
By the end of October, mission controllers determined that it had

55
00:03:33,166 --> 00:03:37,583
exceeded its goal of collecting 60 grams of asteroid material.

56
00:03:37,583 --> 00:03:41,600
They directed it to stow the sample in preparation for return to Earth.

57
00:03:41,600 --> 00:03:45,900
Before departing Bennu, OSIRIS-REx was given one final task.

58
00:03:45,900 --> 00:03:48,533
On April 7, it flew over site Nightingale

59
00:03:48,533 --> 00:03:52,450
to observe how the sample collection event had changed the surface.

60
00:03:52,450 --> 00:03:56,216
And with that, OSIRIS-REx had recorded its mark on Bennu