
NASA TO MOVE AN ASTEROID IN SPACE!
BUT HOW WILL WE KNOW IF IT WORKED!?

1
00:00:05,638 --> 00:00:07,540
This is Lowell Observatory.

2
00:00:07,540 --> 00:00:09,242
Lowell is one of many observatories

3
00:00:09,242 --> 00:00:11,644
around the world that will be observing the DART impact,

4
00:00:11,644 --> 00:00:14,647
NASA's first ever planetary defense test mission

5
00:00:14,647 --> 00:00:18,785
to see how much a spacecraft impact can deflect an asteroid in its orbit.

6
00:00:19,019 --> 00:00:20,754
This is where Pluto was discovered.

7
00:00:20,754 --> 00:00:24,190
And we are still doing research in all areas of astronomy today.

8
00:00:24,657 --> 00:00:26,326
So let's go check it out.

9
00:00:30,630 --> 00:00:32,632
This is the Pluto Telescope,

10
00:00:32,632 --> 00:00:35,702
the telescope that was used to discover Pluto almost a hundred years ago.

11
00:00:36,536 --> 00:00:38,138
So here we are at the Clark Telescope.

12
00:00:38,138 --> 00:00:40,740
This is where Percival Lowell sat to observe Mars.

13
00:00:42,876 --> 00:00:44,844

Let's head on over to the Lowell Discovery Telescope

14
00:00:44,844 --> 00:00:46,179
about an hour south of Flagstaff,

15
00:00:46,179 --> 00:00:49,082
which is where we are going to be collecting data for the DART mission.

16
00:00:49,449 --> 00:00:51,418
And the reason we're all the way out here

17
00:00:51,418 --> 00:00:54,587
in the middle of this forest is that we have really dark skies here.

18
00:01:04,130 --> 00:01:06,199
And this is the Lowell Discovery Telescope.

19
00:01:06,332 --> 00:01:08,701
This is what a 4.3 meter telescope looks like.

20
00:01:08,701 --> 00:01:12,105
This is what we will be using to study Didymos and Dimorphos

21
00:01:12,105 --> 00:01:14,908
in the days and weeks after DART impact.

22
00:01:15,041 --> 00:01:18,511
The DART spacecraft will be hitting an asteroid called Dimorphos.

23
00:01:18,511 --> 00:01:20,480
It's special because it's a binary asteroid,

24
00:01:20,513 --> 00:01:24,050
which means a satellite around a larger asteroid called Didymos.

25
00:01:24,050 --> 00:01:26,653
And DART will actually be hitting Dimorphos.

26
00:01:26,653 --> 00:01:28,955
And what we will be measuring is how much

27
00:01:29,222 --> 00:01:32,592
DART changes the orbit of Dimorphos around Didymos.

28
00:01:32,926 --> 00:01:37,464
So this is an important test for planetary defense mitigation strategies

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00:01:37,464 --> 00:01:39,265
in case we ever have to do this for real.

30
00:01:39,599 --> 00:01:42,402
The Lowell Discovery Telescope is one of many telescopes around the world

31
00:01:42,402 --> 00:01:45,572
which will be used to study Didymos and Dimorphos.

32
00:01:45,805 --> 00:01:47,941
It's really a global, coordinated effort.

33
00:01:48,007 --> 00:01:51,578
And what we're looking at here is a large 4.3 meter primary mirror

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00:01:51,578 --> 00:01:53,813
that's in the middle of the telescope tube here.

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00:01:53,813 --> 00:01:55,882
Up at the top is a secondary mirror.

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00:01:55,915 --> 00:01:58,685
The secondary mirror up top there is what is focusing the light down

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00:01:58,685 --> 00:02:01,020
onto the instruments and allows us to take images

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00:02:01,020 --> 00:02:03,189

with the camera that's located down at the bottom.

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00:02:04,023 --> 00:02:07,260
This is maybe one of my favorite hidden rooms at the telescope.

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00:02:07,427 --> 00:02:10,763
We're like standing inside the telescope, underneath the telescope.

41
00:02:10,763 --> 00:02:15,401
There's a hundred tons above your head held up by this and this, which is cool.

42
00:02:16,236 --> 00:02:20,607
It's sort of, as you can see, the highest peak around here, just over 8,000 feet.

43
00:02:21,174 --> 00:02:24,110
I come up here for sunset because you know, the sun setting right there.

44
00:02:24,110 --> 00:02:25,845
It's just, it's perfect.

45
00:02:26,112 --> 00:02:29,749
For DART, we're going to be collecting images of the night sky.

46
00:02:29,916 --> 00:02:32,318
And typically, an observer would be here in front of one of these consoles

47
00:02:32,318 --> 00:02:33,820
controlling the instrument and taking images

48
00:02:33,820 --> 00:02:36,055
like these as they're coming in off the telescope.

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00:02:36,122 --> 00:02:38,591
DART is really a sort of before-and-after experiment.

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00:02:38,691 --> 00:02:42,662
We need to understand the system before the spacecraft intentionally impacts.

51
00:02:42,662 --> 00:02:45,999
And then we have to understand what the outcome of that impact event is.

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00:02:46,032 --> 00:02:48,067
As we watch from the Earth,

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00:02:48,067 --> 00:02:51,671
Dimorphos will pass in front of Didymos and behind Didymos.

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00:02:51,771 --> 00:02:55,542
What we will be doing with those images is measuring the brightness of Didymos

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00:02:55,542 --> 00:02:58,178
in those images and looking at how that brightness changes

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00:02:58,178 --> 00:03:02,382
and those dips in brightness allow us to measure when these eclipse

57
00:03:02,382 --> 00:03:05,218
happen and measure the orbit period of Dimorphos.

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00:03:05,418 --> 00:03:07,754
And so you have essentially a fixed star field here.

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00:03:07,987 --> 00:03:10,456
All the white dots are stars of different brightness

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00:03:10,456 --> 00:03:13,026
and moving through this field is Didymos and Dimorphos,

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00:03:13,026 --> 00:03:16,062
which, again, we can't distinguish them as discrete points of light,

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00:03:16,062 --> 00:03:20,266
but we have that small object moving through the field of view.

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00:03:20,767 --> 00:03:24,437

So after impact, we will then be able to go back and start

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00:03:24,437 --> 00:03:27,740
observing intensely, looking for those mutual events,

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00:03:27,774 --> 00:03:31,844
those eclipse events of Dimorphos passing in front of and behind Didymos.

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00:03:32,078 --> 00:03:35,782
And on each one of these frames, we're measuring the brightness to assess

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00:03:35,782 --> 00:03:39,352
whether or not it's undergoing one of these events where Dimorphos

68
00:03:39,352 --> 00:03:41,454
is passing in front of or behind.

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00:03:41,454 --> 00:03:46,159
And using those to determine the orbit period of Dimorphos around Didymos.

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00:03:46,626 --> 00:03:49,395
This is such a cool experiment and it's such a singular experiment.

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00:03:49,395 --> 00:03:53,399
Using the ground-based telescopes like this one and others around the world

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00:03:53,399 --> 00:03:57,237
to watch the system and see how it's affected by this impact event,

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00:03:57,270 --> 00:04:00,540
because that's really what's going to give us the answer to

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00:04:00,540 --> 00:04:03,343
what did DART do at the time of impact?

75
00:04:03,443 --> 00:04:06,412
And that will be exciting to see how that evolves over the days and