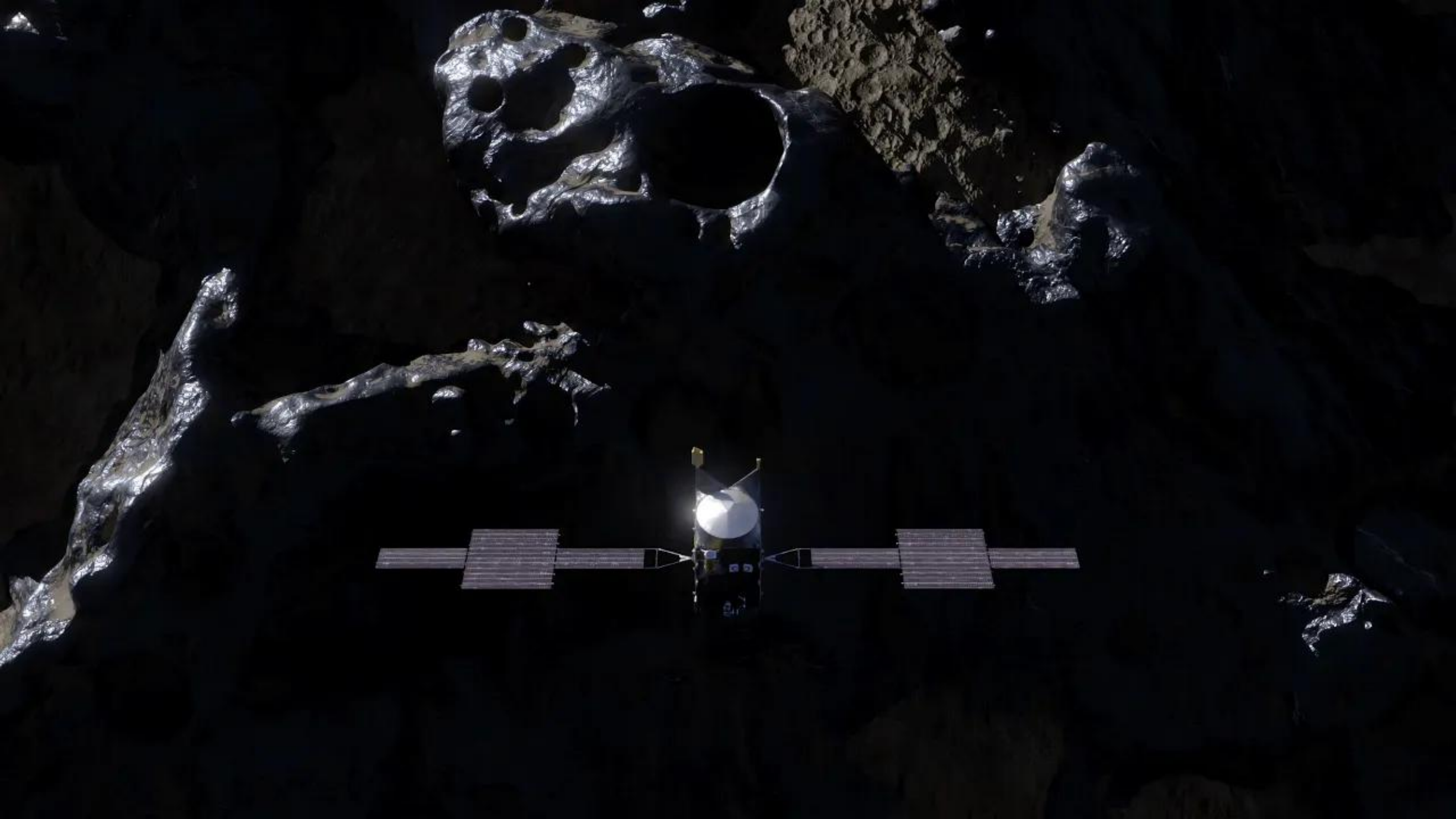

1
00:00:00,208 --> 00:00:05,422
■■

2
00:00:05,422 --> 00:00:08,591
We've never detected
a magnetic field around

3
00:00:08,591 --> 00:00:12,762
an asteroid, but we've
measured magnetization

4
00:00:12,762 --> 00:00:15,932
in meteorite samples.

5
00:00:15,932 --> 00:00:19,602
I can remember so clearly
the day that we talked about

6
00:00:19,602 --> 00:00:22,605
the concept that actually
led to the mission. I had

7
00:00:22,605 --> 00:00:24,941
just finished teaching a
course and I came out of

8
00:00:24,941 --> 00:00:27,110
the classroom and Ben was
standing there. His office

9
00:00:27,110 --> 00:00:29,237
is right there, and he said,
“Lindy, we just made a

10
00:00:29,237 --> 00:00:32,282
measurement from this
meteorite that shows that

11
00:00:32,282 --> 00:00:34,951

it has a magnetic field
that it recorded from

12
00:00:34,951 --> 00:00:37,537
back at the time
of its formation.

13
00:00:37,537 --> 00:00:39,622
We don't understand how
this could happen. Can we

14
00:00:39,622 --> 00:00:42,250
talk about it for a minute?
Maybe you have some ideas.

15
00:00:42,250 --> 00:00:44,878
I was like, “I totally have
an idea. It's based on what

16
00:00:44,878 --> 00:00:47,088
I was just teaching.” And
we sat down in his office

17
00:00:47,088 --> 00:00:49,090
and we drew things on the
whiteboard and suddenly we

18
00:00:49,090 --> 00:00:52,218
had this idea about how
planetesimals could form.

19
00:00:52,218 --> 00:00:56,556
We wrote a paper about this
idea. That paper was read

20
00:00:56,556 --> 00:01:00,602
by Daniel Lankerd and
Bruce Bills at JPL, who

21
00:01:00,602 --> 00:01:03,605

actually ended up
contacting us and proposing

22
00:01:03,605 --> 00:01:06,441
to build a
mission around it.

23
00:01:06,441 --> 00:01:09,736
Psyche represents one of
the best opportunities we'll

24
00:01:09,736 --> 00:01:13,198
have to search for the
first evidence of asteroid

25
00:01:13,198 --> 00:01:16,993
magnetism. It's now long
frozen, billions of years

26
00:01:16,993 --> 00:01:19,746
ago, but that ancient
magnetic field that it

27
00:01:19,746 --> 00:01:23,708
could have generated could
be imprinted in the surface

28
00:01:23,708 --> 00:01:26,711
layers of Psyche which
cooled in the presence of

29
00:01:26,711 --> 00:01:28,922
this field. And so, they
would have what we call

30
00:01:28,922 --> 00:01:32,801
magnetization, which is
like a fossil or an echo of

31
00:01:32,801 --> 00:01:37,013

the ancient magnetic
field that it generated.

32
00:01:37,013 --> 00:01:39,390
And the way you sense
magnetic fields is you use

33
00:01:39,390 --> 00:01:41,434
an instrument called a
magnetometer and that's

34
00:01:41,434 --> 00:01:44,062
what we have on Psyche.

35
00:01:44,062 --> 00:01:51,694
■

36
00:01:51,694 --> 00:01:54,656
The Psyche team contacted
us because they know we

37
00:01:54,656 --> 00:01:58,660
have very high-quality
magnetometer based on

38
00:01:58,660 --> 00:02:02,122
the magnetic materials
that, that we are producing.

39
00:02:02,122 --> 00:02:05,792
So, we have a huge
experience in how to do

40
00:02:05,792 --> 00:02:08,628
this and how to drive
space magnetometers on

41
00:02:08,628 --> 00:02:11,131
very long timescales.
Here, we're talking many,

42
00:02:11,131 --> 00:02:11,881
many years.

43
00:02:11,881 --> 00:02:13,174
We build the hardware.

44
00:02:13,174 --> 00:02:16,719
We qualify hardware here
on ground. We calibrate the

45
00:02:16,719 --> 00:02:20,306
hardware and then we
deliver it to Psyche, and

46
00:02:20,306 --> 00:02:23,935
MIT is responsible for the
science operations and

47
00:02:23,935 --> 00:02:29,023
data processing of the
magnetometer from Psyche.

48
00:02:29,023 --> 00:02:31,568
The magnetometer is on
the whole time. It turns on

49
00:02:31,568 --> 00:02:34,445
after launch. It's on for
the whole mission. And so,

50
00:02:34,445 --> 00:02:38,366
we'll have a lot of time
to observe the signals

51
00:02:38,366 --> 00:02:42,370
from the spacecraft and to
calibrate for those. So, by

52

00:02:42,370 --> 00:02:45,498
the time we actually get to
Psyche we'll be able to get

53
00:02:45,498 --> 00:02:48,835
a good, clean
measurement of the

54
00:02:48,835 --> 00:02:52,547
asteroid's magnetic field.

55
00:02:52,547 --> 00:02:56,009
So, my role was to
model the interaction of

56
00:02:56,009 --> 00:02:59,095
the asteroid with the solar
wind and then kind of fly a

57
00:02:59,095 --> 00:03:03,057
simulated Psyche to
fly through the simulated

58
00:03:03,057 --> 00:03:08,229
asteroid. This is a 3-D
print of Psyche. So, if

59
00:03:08,229 --> 00:03:10,690
this asteroid is magnetized
you can imagine a magnetic

60
00:03:10,690 --> 00:03:12,567
field around it, kind of
like the earth magnetic

61
00:03:12,567 --> 00:03:15,987
field, like a big bubble
but like smaller, and then

62
00:03:15,987 --> 00:03:17,906

you're going to have the
solar wind flying around it,

63
00:03:17,906 --> 00:03:20,366
a bunch of electrons and
protons coming in from the

64
00:03:20,366 --> 00:03:23,244
sun interacting with this
magnetic field and changing

65
00:03:23,244 --> 00:03:26,372
it constantly. And then,
we're kind of flying in a

66
00:03:26,372 --> 00:03:30,043
small computer-generated
spacecraft that is going to

67
00:03:30,043 --> 00:03:32,337
measure this magnetic
field while everything is

68
00:03:32,337 --> 00:03:35,632
changing and analyze it and
say, “Are we going to be

69
00:03:35,632 --> 00:03:38,009
able to tell if there's a
magnetic field coming in

70
00:03:38,009 --> 00:03:41,179
from this body, or are we
just seeing all this space

71
00:03:41,179 --> 00:03:42,722
magnetic field around it?”

72
00:03:42,722 --> 00:03:45,683
The real precise mapping

that we expect to do when

73
00:03:45,683 --> 00:03:48,186
we are closest in on
the asteroid, when we are

74
00:03:48,186 --> 00:03:51,022
really orbiting close in
the final science orbit.

75
00:03:51,022 --> 00:03:55,526
But, it's possible that
Psyche is so magnetic that

76
00:03:55,526 --> 00:03:57,820
we could even detect its
field before we go into

77
00:03:57,820 --> 00:04:02,492
orbit. That's conceivable.

78
00:04:02,492 --> 00:04:04,827
This is my first
opportunity to actually be

79
00:04:04,827 --> 00:04:07,830
involved with that
process of designing the

80
00:04:07,830 --> 00:04:11,793
investigation and figuring
out how to clean up that

81
00:04:11,793 --> 00:04:14,879
data so it will be usable
by the science community

82
00:04:14,879 --> 00:04:16,005
at large.

83
00:04:16,005 --> 00:04:18,925
An important part of
building a space mission

84
00:04:18,925 --> 00:04:22,387
is to imagine the whole
range of possibilities and

85
00:04:22,387 --> 00:04:23,888
to build for all of them.

86
00:04:23,888 --> 00:04:28,059
A big part of the spirit of
the team is to talk across

87
00:04:28,059 --> 00:04:31,771
disciplines. I get a chance
to share my science with

88
00:04:31,771 --> 00:04:34,482
this very broad
group of people.

89
00:04:34,482 --> 00:04:37,986
Everybody on this mission
is dedicated in a way you

90
00:04:37,986 --> 00:04:40,947
rarely ever see anywhere
else and that actually

91
00:04:40,947 --> 00:04:43,074
makes a huge difference
when you are trying to

92
00:04:43,074 --> 00:04:44,659
achieve a
goal this difficult.

93

00:04:44,659 --> 00:04:48,663
Never did I ever imagine
that I would actually be

94
00:04:48,663 --> 00:04:52,000
involved in a project to
actually send a spacecraft

95
00:04:52,000 --> 00:04:55,712
up to an asteroid. Being
able to basically be part

96
00:04:55,712 --> 00:04:57,964
what feels like
live science fiction is

97
00:04:57,964 --> 00:05:00,967
something that for me that
I really enjoy about this.

98
00:05:00,967 --> 00:05:04,512
If we can do things like
send this robotic orbiter

99
00:05:04,512 --> 00:05:07,598
out to this asteroid so
far away to learn things

100
00:05:07,598 --> 00:05:10,268
that we cannot learn in
person, then surely, we can

101
00:05:10,268 --> 00:05:12,186
solve these problems that
are in front of us here on