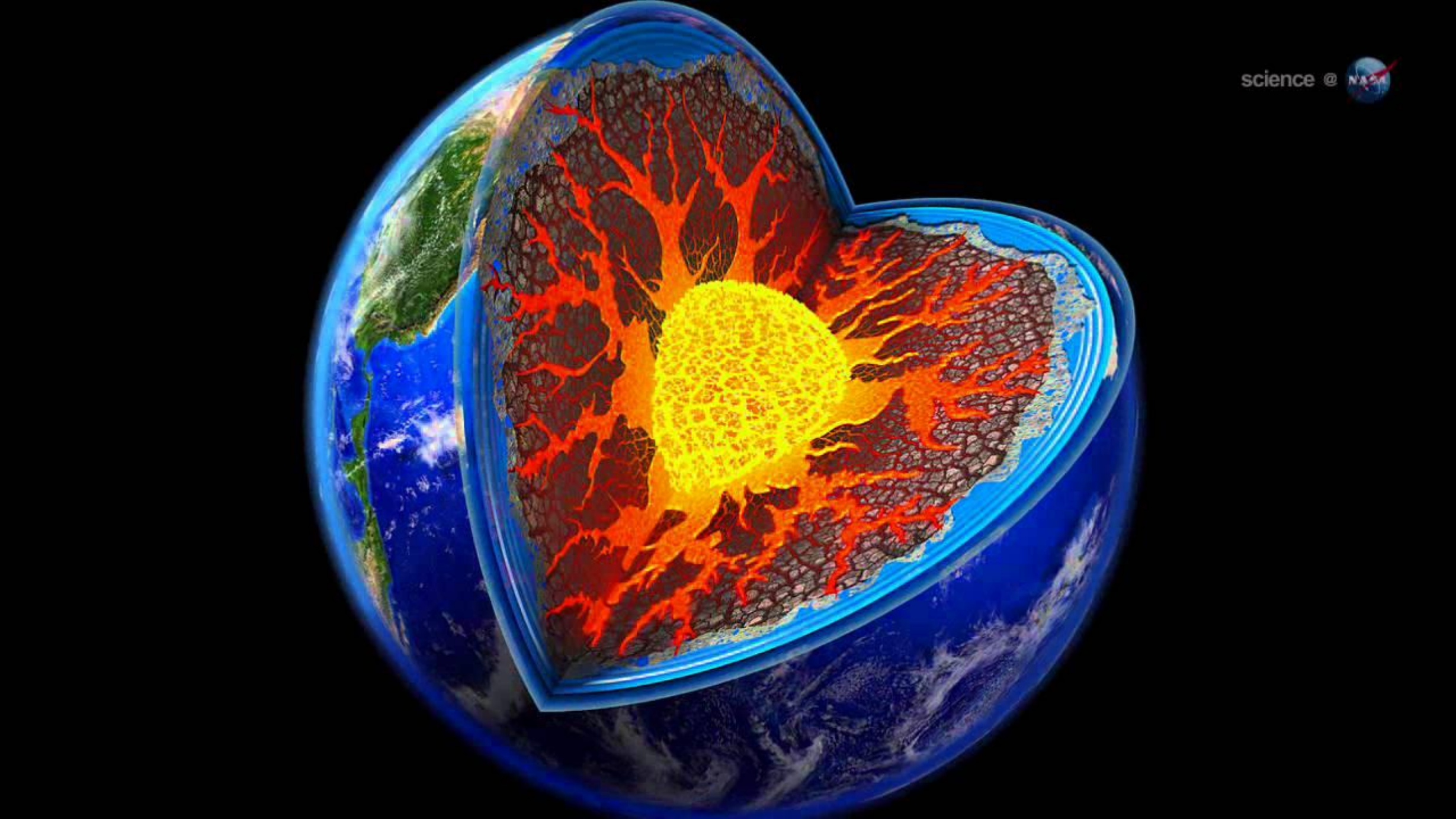
science @ NASA

1
00:00:09,589 --> 00:00:06,710
don't judge a moon by its cover

2
00:00:11,910 --> 00:00:09,599
presented by science at nasa

3
00:00:14,070 --> 00:00:11,920
at first glance saturn's moon phoebe

4
00:00:17,109 --> 00:00:14,080
doesn't look much like a planet it's

5
00:00:19,590 --> 00:00:17,119
only 220 kilometers in diameter smaller

6
00:00:21,990 --> 00:00:19,600
by far than most u.s states

7
00:00:24,070 --> 00:00:22,000
the moonlit is dark airless and pitted

8
00:00:25,189 --> 00:00:24,080
with craters nearly as wide as phoebe

9
00:00:27,750 --> 00:00:25,199
itself

10
00:00:30,470 --> 00:00:27,760
yet researchers have just announced that

11
00:00:32,790 --> 00:00:30,480
this small apparently misshapen hunk of

12
00:00:35,430 --> 00:00:32,800
ice and rock orbiting backwards around

13
00:00:36,870 --> 00:00:35,440

saturn is more like a planet than anyone

14
00:00:38,869 --> 00:00:36,880
imagined

15
00:00:40,630 --> 00:00:38,879
astronomers have long known that phoebe

16
00:00:43,350 --> 00:00:40,640
wasn't like other moons in the saturn

17
00:00:46,389 --> 00:00:43,360
system so when nasa's cassini spacecraft

18
00:00:48,310 --> 00:00:46,399
reached saturn in 2004 visiting phoebe

19
00:00:50,790 --> 00:00:48,320
was a top priority

20
00:00:53,430 --> 00:00:50,800
in fact it was the first moon cassini

21
00:00:55,510 --> 00:00:53,440
encountered on its way into saturn

22
00:00:57,990 --> 00:00:55,520
data from the flyby have occupied

23
00:00:59,670 --> 00:00:58,000
mission scientists ever since and they

24
00:01:02,950 --> 00:00:59,680
released their findings in the journal

25
00:01:05,109 --> 00:01:02,960
icarus in april 2012

26
00:01:06,950 --> 00:01:05,119
by combining cassini data with modeling

27
00:01:09,350 --> 00:01:06,960
techniques previously applied to other

28
00:01:11,429 --> 00:01:09,360
solar system bodies we've been able to

29
00:01:12,870 --> 00:01:11,439
go back in time and clarify why phoebe

30
00:01:15,590 --> 00:01:12,880
is so different from the rest of the

31
00:01:17,749 --> 00:01:15,600
saturn system says jonathan lanine a

32
00:01:20,630 --> 00:01:17,759
co-author on the study and a cassini

33
00:01:22,469 --> 00:01:20,640
team member at cornell university

34
00:01:24,789 --> 00:01:22,479
first of all phoebe is more spherical

35
00:01:27,270 --> 00:01:24,799
than it looks grid lines wrapped around

36
00:01:30,069 --> 00:01:27,280
the moon resemble a well-worn classroom

37
00:01:31,350 --> 00:01:30,079
globe once round but a bit battered from

38
00:01:33,270 --> 00:01:31,360

overuse

39
00:01:36,469 --> 00:01:33,280
cratering has made the body visually

40
00:01:38,870 --> 00:01:36,479
irregular but in the distant past it was

41
00:01:41,190 --> 00:01:38,880
clearly much more uniform

42
00:01:43,590 --> 00:01:41,200
co-author peter thomas a cassini team

43
00:01:45,910 --> 00:01:43,600
member at cornell explains

44
00:01:47,590 --> 00:01:45,920
from the shape seen in cassini images

45
00:01:50,069 --> 00:01:47,600
and modeling the likely cratering

46
00:01:52,710 --> 00:01:50,079
history we were able to see that phoebe

47
00:01:54,710 --> 00:01:52,720
started with a nearly spherical shape

48
00:01:56,870 --> 00:01:54,720
apparently phoebe formed early enough in

49
00:01:59,429 --> 00:01:56,880
the solar system's history to capture

50
00:02:01,590 --> 00:01:59,439
radioactive materials in its core

51
00:02:03,270 --> 00:02:01,600
as in the core of earth radioactive

52
00:02:05,510 --> 00:02:03,280
decay inside phoebe would produce a

53
00:02:07,749 --> 00:02:05,520
significant amount of heat warming the

54
00:02:08,790 --> 00:02:07,759
interior and reshaping the moon into a

55
00:02:10,869 --> 00:02:08,800
sphere

56
00:02:13,110 --> 00:02:10,879
in this scenario heavier materials would

57
00:02:14,869 --> 00:02:13,120
sink to the core and lighter materials

58
00:02:17,510 --> 00:02:14,879
would float to the top

59
00:02:19,589 --> 00:02:17,520
indeed cassini data indicate that phoebe

60
00:02:22,390 --> 00:02:19,599
has denser rock-rich material

61
00:02:23,350 --> 00:02:22,400
concentrated near its center internal

62
00:02:25,670 --> 00:02:23,360
heating

63
00:02:27,910 --> 00:02:25,680

layering a spherical shape

64
00:02:29,589 --> 00:02:27,920
planets have these same properties

65
00:02:31,830 --> 00:02:29,599
this doesn't mean though that phoebe is

66
00:02:33,750 --> 00:02:31,840
a full-fledged planet

67
00:02:36,070 --> 00:02:33,760
objects like phoebe represent building

68
00:02:39,430 --> 00:02:36,080
blocks of planets says jpl's julie

69
00:02:41,190 --> 00:02:39,440
castillo rojas lead author of the study

70
00:02:43,190 --> 00:02:41,200
they give scientists clues about what

71
00:02:46,229 --> 00:02:43,200
conditions were like around the time of

72
00:02:47,830 --> 00:02:46,239
the birth of planets and their moons

73
00:02:50,309 --> 00:02:47,840
the researchers believe phoebe is

74
00:02:52,710 --> 00:02:50,319
probably a cousin of pluto born in the

75
00:02:55,430 --> 00:02:52,720
outer reaches of the solar system

76
00:02:57,430 --> 00:02:55,440
this would solve a number of mysteries

77
00:02:59,670 --> 00:02:57,440
while saturn's regular moons orbit in a

78
00:03:01,030 --> 00:02:59,680
common plane and go around the planet in

79
00:03:03,509 --> 00:03:01,040
the same direction

80
00:03:06,710 --> 00:03:03,519
phoebe's orbit is tilted and retrograde

81
00:03:08,790 --> 00:03:06,720
it actually circles saturn backwards

82
00:03:10,949 --> 00:03:08,800
at some point in the distant past the

83
00:03:13,350 --> 00:03:10,959
little planetesimal probably wandered by

84
00:03:15,430 --> 00:03:13,360
saturn and got caught by the gas giant's

85
00:03:16,790 --> 00:03:15,440
gravitational field

86
00:03:19,270 --> 00:03:16,800
given that phoebe's density and

87
00:03:20,869 --> 00:03:19,280
composition are similar to pluto's it is

88
00:03:22,630 --> 00:03:20,879

likely that phoebe came from the same

89
00:03:24,949 --> 00:03:22,640
place pluto lives

90
00:03:28,869 --> 00:03:24,959
the kuiper belt the region of ancient

91
00:03:30,949 --> 00:03:28,879
icy rocky bodies beyond neptune's orbit

92
00:03:33,830 --> 00:03:30,959
remarkably phoebe is just one of more

93
00:03:36,149 --> 00:03:33,840
than 60 moons in the saturn system each

94
00:03:39,589 --> 00:03:36,159
with its own unique history

95
00:03:41,910 --> 00:03:39,599
at least 59 stories remain to be told

96
00:03:44,309 --> 00:03:41,920
for more news from saturn as cassini