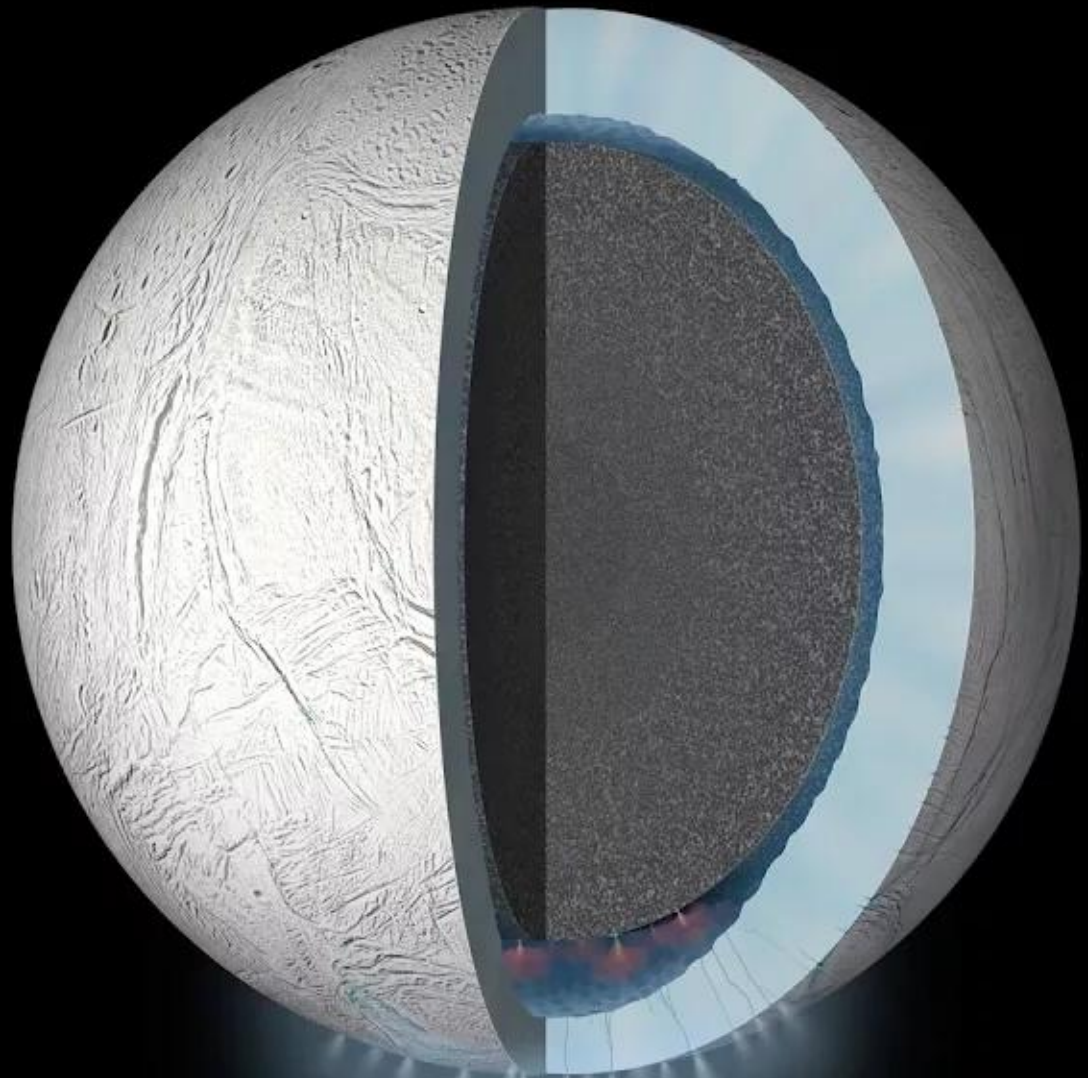

1
00:00:00,900 --> 00:00:02,101
Ingredients for
Life at Enceladus

2
00:00:02,134 --> 00:00:03,102
NASA Jet Propulsion Laboratory

3
00:00:03,135 --> 00:00:04,103
California Institute
of Technology

4
00:00:04,136 --> 00:00:05,438
[■]

5
00:00:05,471 --> 00:00:07,940
In 2015 NASA's
Cassini spacecraft

6
00:00:07,973 --> 00:00:10,109
made the deepest dive ever

7
00:00:10,142 --> 00:00:11,611
through a plume of gas and ice

8
00:00:11,644 --> 00:00:14,313
spraying from the south pole
of Saturn's moon Enceladus.

9
00:00:14,346 --> 00:00:15,448
[■]

10
00:00:15,481 --> 00:00:18,451
A Cassini science instrument
"sniffed" the plume

11
00:00:18,484 --> 00:00:20,053
and detected hydrogen.

12

00:00:21,321 --> 00:00:22,588
Hunter Waite, Ion and Neutral
Mass Spectrometer Team Lead

13
00:00:22,621 --> 00:00:23,589
Southwest Research Institute:

14
00:00:23,622 --> 00:00:25,591
The instrument acts
like a human nose

15
00:00:25,624 --> 00:00:27,060
analyzing the smell,
so to speak,

16
00:00:27,093 --> 00:00:29,495
or the composition of the
gases in the environment.

17
00:00:29,528 --> 00:00:33,266
There was a significant amount
of molecular hydrogen.

18
00:00:34,266 --> 00:00:37,170
What makes this
hydrogen important?

19
00:00:37,203 --> 00:00:39,672
The existence of
molecular hydrogen,

20
00:00:39,705 --> 00:00:42,742
at least within the
Earth's ocean system,

21
00:00:42,775 --> 00:00:45,178
is a... like a food source.

22
00:00:45,211 --> 00:00:46,979
It's candy for microbes.

23
00:00:47,012 --> 00:00:48,514
They eat the hydrogen,

24
00:00:48,547 --> 00:00:50,116
they turn it into methane.

25
00:00:50,149 --> 00:00:53,519
And with our findings we
were able to not only

26
00:00:53,552 --> 00:00:55,922
find out that there
was H2 in the system,

27
00:00:55,955 --> 00:00:59,525
but to examine the chemistry
that's associated with

28
00:00:59,558 --> 00:01:04,497
that process of taking hydrogen
and turning it into methane.

29
00:01:05,798 --> 00:01:08,134
Cassini previously discovered
there's a salty, global ocean

30
00:01:08,167 --> 00:01:09,502
under Enceladus' icy crust

31
00:01:09,535 --> 00:01:12,371
and that hot ocean water
was coming into contact

32
00:01:12,404 --> 00:01:13,639
with a rocky sea floor.

33
00:01:13,672 --> 00:01:17,343
Here on Earth the hydrothermal

systems known as white smokers

34
00:01:17,376 --> 00:01:19,545
have water-rock
interactions that lead to

35
00:01:19,578 --> 00:01:21,714
the release of
molecular hydrogen

36
00:01:21,747 --> 00:01:23,382
in a similar fashion to,

37
00:01:23,415 --> 00:01:25,885
apparently, what's going
on at Enceladus.

38
00:01:26,886 --> 00:01:28,788
Life requires three
primary ingredients

39
00:01:28,821 --> 00:01:33,459
Liquid water. Source of energy.
Right chemical ingredients.

40
00:01:33,492 --> 00:01:37,096
This is just the final
step that shows

41
00:01:37,129 --> 00:01:39,866
that there's molecular
hydrogen being produced

42
00:01:39,899 --> 00:01:42,135
by these same
hydrothermal processes.

43
00:01:42,168 --> 00:01:45,805
And that molecular hydrogen
has the chemical energy

44
00:01:45,838 --> 00:01:49,142
to support microbial systems
in the interior ocean.

45
00:01:49,175 --> 00:01:53,246
It's not demonstration
of finding life,

46
00:01:53,279 --> 00:01:57,083
but it shows the potential
for the existence of life

47
00:01:57,116 --> 00:01:58,718
in this interior ocean.

48
00:01:59,452 --> 00:02:00,686
NASA Jet Propulsion Laboratory