1
00:00:00,350 --> 00:00:03,390
>> In this "Science Off the
Sphere" involves filling a

2
00:00:03,390 --> 00:00:07,420
balloon up with water and
popping it and what happens

3
00:00:07,420 --> 00:00:09,930
to it in a weightless
environment.

4
00:00:09,930 --> 00:00:14,700
We're going to see this many
times during this short video,

5
00:00:14,700 --> 00:00:18,740
so we'll be able to look
at some of the physics.

6
00:00:18,740 --> 00:00:21,460
So there's the balloon, and
I've got a little needle,

7
00:00:21,460 --> 00:00:22,720
and you pop it.

8
00:00:22,720 --> 00:00:28,420
And you can watch the --
you can observe the behavior

9
00:00:28,420 --> 00:00:32,850
of the water without having a
gravitational effects make it

10
00:00:32,850 --> 00:00:34,910
just fall to the floor.

11
00:00:34,910 --> 00:00:37,180

So here we go again.

12
00:00:37,180 --> 00:00:39,150
And you pop this thing.

13
00:00:39,150 --> 00:00:42,150
The skin disappears really
quick, and you're left

14
00:00:42,150 --> 00:00:44,770
with a pseudosphere of
water that undulates

15
00:00:44,770 --> 00:00:45,720
around a little bit

16
00:00:45,720 --> 00:00:48,900
and eventually surface
tension forces will convert it

17
00:00:48,900 --> 00:00:50,990
into a sphere.

18
00:00:50,990 --> 00:00:53,180
Or no, this is a slow motion.

19
00:00:53,180 --> 00:00:54,360
So watch closely.

20
00:00:54,360 --> 00:00:55,820
So it goes pop.

21
00:00:55,820 --> 00:00:58,660
The skin disappears
really, really quickly,

22
00:00:58,660 --> 00:01:04,250
and then two shockwaves
form as a result

23
00:01:04,250 --> 00:01:06,730
of the rubber skin peeling away,

24
00:01:06,730 --> 00:01:09,920
and they're on opposite
ends of the balloon.

25
00:01:09,920 --> 00:01:14,390
And they come together in the
middle and make it squeeze

26
00:01:14,390 --> 00:01:17,150
out kind of like a pancake.

27
00:01:17,150 --> 00:01:19,580
And this -- and then after that,

28
00:01:19,580 --> 00:01:25,070
surface tension forces will
make the resultant water pull

29
00:01:25,070 --> 00:01:27,100
together in an undulating mass

30
00:01:27,100 --> 00:01:31,280
until it eventually forms
a nice, pretty sphere.

31
00:01:31,280 --> 00:01:33,590
So again, here's a balloon.

32
00:01:33,590 --> 00:01:34,980
It gets popped.

33
00:01:34,980 --> 00:01:39,240
Notice the rubber peels away,
and you're left with this water

34
00:01:39,240 --> 00:01:42,000
in the shape of what
used to be the balloon.

35
00:01:42,000 --> 00:01:44,800
And then, here, you can see
the two shockwaves moving

36
00:01:44,800 --> 00:01:47,770
in towards the center,
squeezing the water

37
00:01:47,770 --> 00:01:50,290
into a pancake-like structure.

38
00:01:50,290 --> 00:01:56,830
And then surface tension forces
will pull on that pancake

39
00:01:56,830 --> 00:01:58,890
and make it into a potato,

40
00:01:58,890 --> 00:02:00,930
and then that potato
oscillates around.

41
00:02:00,930 --> 00:02:04,020
And eventually you'll end up
with a nice, pretty sphere.

42
00:02:05,860 --> 00:02:08,180
And of course, you can't
do this too many times.

43
00:02:08,180 --> 00:02:09,730
I mean, this is really neat.

44
00:02:09,730 --> 00:02:14,330
So here's, yet, one more

example of what happens.

45
00:02:14,330 --> 00:02:16,810
And each one is a
little different.

46
00:02:18,000 --> 00:02:21,920
And again, the skin peels away
really quickly, and you're left

47
00:02:21,920 --> 00:02:27,370
with this unsupported
shape of water,

48
00:02:27,370 --> 00:02:29,880
which on Earth would
just fall to the ground

49
00:02:29,880 --> 00:02:32,570
under gravitational
forces really quickly.

50
00:02:32,570 --> 00:02:37,660
And you won't be able to
see the resultant behavior.

51
00:02:37,660 --> 00:02:40,150
Now, the balloons that
I had here were kind

52
00:02:40,150 --> 00:02:42,960
of oval shaped, or oblong.

53
00:02:42,960 --> 00:02:45,530
Well, I found one that
was more spherical.

54
00:02:45,530 --> 00:02:47,940
So let's look what happens
with something that's close

55
00:02:47,940 --> 00:02:50,950
to a sphere when the
rubber balloon is removed.

56
00:02:50,950 --> 00:02:52,850
So here it goes.

57
00:02:53,990 --> 00:02:56,600
So, again, the skin peels away.

58
00:02:56,600 --> 00:03:00,240
You're left with this close to
sphere of water unsupported.

59
00:03:00,240 --> 00:03:02,610
You see some ripples
on the surface.

60
00:03:02,610 --> 00:03:06,760
And now you can see the two
shockwaves coming together

61
00:03:06,760 --> 00:03:08,940
and squeezing it into a pancake.

62
00:03:08,940 --> 00:03:11,310
And this is a really
interesting example

63
00:03:11,310 --> 00:03:15,810
where a single point
initiated shockwave will end

64
00:03:15,810 --> 00:03:21,030
up making two adjacent
shockwaves coming together

65
00:03:21,030 --> 00:03:23,990

in the middle and squeezing
this into a pancake.

66
00:03:23,990 --> 00:03:25,200
Oh, and watch this.

67
00:03:25,200 --> 00:03:27,870
It formed this long
column of water,

68
00:03:27,870 --> 00:03:30,960
and then the really instability
comes and breaks it up.

69
00:03:30,960 --> 00:03:33,140
If you have a column
of water greater

70
00:03:33,140 --> 00:03:35,100
than Pi times the diameter,

71
00:03:35,100 --> 00:03:37,570
it becomes unstable
and it breaks up.

72
00:03:37,570 --> 00:03:40,900
So here's the final one
shown in real speed.

73
00:03:40,900 --> 00:03:45,510
And I want to end this by
saying that we did all of these

74
00:03:45,510 --> 00:03:49,080
in our hygiene area, and we
had plenty of towels around.

75
00:03:49,080 --> 00:03:53,090
You can see after you
release one of these spheres,

76
00:03:53,090 --> 00:03:55,270
you can easily capture
that in a towel.

77
00:03:55,270 --> 00:03:56,960
And now you have a wet towel.