

STEMonstrations



NEWTON'S 3RD LAW

1
00:00:00,967 --> 00:00:15,615

[MUSIC]

2
00:00:15,615 --> 00:00:16,750

>> WELCOME TO THE INTERNATIONAL

3
00:00:16,750 --> 00:00:17,951

SPACE STATION.

4
00:00:17,951 --> 00:00:19,119

I'M NASA ASTRONAUT

5
00:00:19,119 --> 00:00:20,487

MARK VANDE HEI.

6
00:00:20,487 --> 00:00:21,988

TODAY, WE'RE GOING TO TALK

7
00:00:21,988 --> 00:00:24,090

ABOUT NEWTON'S THIRD LAW.

8
00:00:24,090 --> 00:00:25,258

HOW DO YOU THINK IT WILL

9
00:00:25,258 --> 00:00:28,261
HOLD UP IN MICROGRAVITY?

10
00:00:28,261 --> 00:00:29,095

>> FOR EVERY ACTION,

11
00:00:29,095 --> 00:00:29,796

THERE IS AN EQUAL AND

12
00:00:29,796 --> 00:00:31,297

OPPOSITE REACTION.

13
00:00:31,297 --> 00:00:32,031

THIS MEANS THAT

14

00:00:32,031 --> 00:00:33,233
IN EVERY INTERACTION BETWEEN

15

00:00:33,233 --> 00:00:34,501
TWO OBJECTS, THERE ARE A PAIR

16

00:00:34,501 --> 00:00:35,702
OF OPPOSITE FORCES ACTING

17

00:00:35,702 --> 00:00:37,070
ON EACH OBJECT AT THE SAME

18

00:00:37,070 --> 00:00:39,706
TIME-- A FORCE PAIR.

19

00:00:39,706 --> 00:00:40,473
YOU CAN SEE THAT THERE ARE

20

00:00:40,473 --> 00:00:41,574
MANY EXAMPLES ON EARTH.

21

00:00:42,709 --> 00:00:51,818
[MUSIC]

22

00:00:51,818 --> 00:00:53,386
IN SPACE, THRUSTERS EXPEL

23

00:00:53,386 --> 00:00:54,554
ONE WAY AND THE VEHICLE IS

24

00:00:54,554 --> 00:00:56,890
STEERED IN THE OPPOSITE WAY.

25

00:00:56,890 --> 00:00:57,590
>> HELLO AGAIN.

26
00:00:57,590 --> 00:00:58,391
MORE BASKETBALL STUNTS THAT

27
00:00:58,391 --> 00:01:00,593
I CAN'T DO ON THE GROUND--

28
00:01:00,593 --> 00:01:02,362
AT LEAST NOT WHILE GETTING

29
00:01:02,362 --> 00:01:05,532
THIS MUCH HANG TIME.

30
00:01:07,600 --> 00:01:08,268
ALL RIGHT, BACK TO

31
00:01:08,268 --> 00:01:09,769
SERIOUS BUSINESS.

32
00:01:09,769 --> 00:01:10,437
I'VE GOT A BASKETBALL

33
00:01:10,437 --> 00:01:12,305
RIGHT HERE.

34
00:01:12,305 --> 00:01:14,307
IT'S GOING TO BE OBJECT 1.

35
00:01:14,307 --> 00:01:16,609
I'M THE SECOND OBJECT.

36
00:01:16,609 --> 00:01:18,845
IF OBJECT 2-- MYSELF--

37
00:01:18,845 --> 00:01:21,414
APPLIES A FORCE TO OBJECT 1,

38
00:01:21,414 --> 00:01:22,515

THEN THAT SAME FORCE WILL BE

39

00:01:22,515 --> 00:01:23,450
APPLIED, ACCORDING TO

40

00:01:23,450 --> 00:01:25,585
NEWTON'S THIRD LAW,

41

00:01:25,585 --> 00:01:27,787
BY OBJECT 1 ONTO OBJECT 2.

42

00:01:27,787 --> 00:01:28,721
HOWEVER, THERE'S A BIG

43

00:01:28,721 --> 00:01:29,823
DISPARITY IN THE MASS.

44

00:01:29,823 --> 00:01:31,257
OBJECT 1 IS A VERY LIGHT

45

00:01:31,257 --> 00:01:32,292
MASS OBJECT.

46

00:01:32,292 --> 00:01:34,060
OBJECT 2, MYSELF, IS

47

00:01:34,060 --> 00:01:36,963
A LARGER MASS OBJECT.

48

00:01:36,963 --> 00:01:38,064
SO I'M GOING TO TRY AND MAKE

49

00:01:38,064 --> 00:01:39,098
MYSELF ABOUT THE SAME SHAPE

50

00:01:39,098 --> 00:01:40,667
AS THIS BALL--

51
00:01:40,667 --> 00:01:43,303
SEE HOW THAT WORKS FOR US.

52
00:01:43,303 --> 00:01:44,037
AND I'M GOING TO APPLY

53
00:01:44,037 --> 00:01:47,207
THAT FORCE.

54
00:01:47,207 --> 00:01:49,008
YOU SAW THAT FORCE APPLIED

55
00:01:49,008 --> 00:01:50,210
TO THE BALL MADE IT

56
00:01:50,210 --> 00:01:51,344
ACCELERATE QUITE A BIT.

57
00:01:51,344 --> 00:01:52,011
IT REALLY DIDN'T

58
00:01:52,011 --> 00:01:53,713
ACCELERATE ME MUCH AT ALL.

59
00:01:53,713 --> 00:01:54,614
NEWTON'S THIRD LAW AGAIN,

60
00:01:54,614 --> 00:01:55,248
BUT THIS TIME

61
00:01:55,248 --> 00:01:55,915
WE'RE GOING TO USE TWO

62
00:01:55,915 --> 00:01:56,683
SIMILARLY MASSED OBJECTS.

63
00:01:56,683 --> 00:01:57,584

JOE AND I HAVE ABOUT

64

00:01:57,584 --> 00:01:58,585
THE SAME MASS.

65

00:01:58,585 --> 00:01:59,853
SO JOE, GET INTO A BALL.

66

00:01:59,853 --> 00:02:00,954
I'LL DO THE SAME.

67

00:02:00,954 --> 00:02:01,688
I'M GOING TO FACE YOU THIS WAY

68

00:02:01,688 --> 00:02:02,422
SO I DON'T THROW YOU INTO

69

00:02:02,422 --> 00:02:03,490
SOMETHING YOU CAN'T SEE.

70

00:02:03,490 --> 00:02:04,257
>> ALL RIGHT.

71

00:02:04,257 --> 00:02:04,891
>> NOW I'M GOING TO GET INTO

72

00:02:04,891 --> 00:02:06,392
A BALL BEHIND JOE AND

73

00:02:06,392 --> 00:02:07,126
I'M GOING TO APPLY A FORCE

74

00:02:07,126 --> 00:02:08,194
TO HIM.

75

00:02:15,835 --> 00:02:17,237
NOTICE THAT WHEN I APPLY

76

00:02:17,237 --> 00:02:18,338

THE FORCE TO JOE,

77

00:02:18,338 --> 00:02:19,472

IT ACCELERATED JOE AWAY

78

00:02:19,472 --> 00:02:20,940

FROM ME, BUT I GOT ACCELERATED

79

00:02:20,940 --> 00:02:22,509

AWAY FROM HIM AS WELL,

80

00:02:22,509 --> 00:02:23,409

BECAUSE THE FORCE APPLIED

81

00:02:23,409 --> 00:02:24,844

TO JOE ENDED UP BEING

82

00:02:24,844 --> 00:02:25,678

THE SAME FORCE THAT WAS

83

00:02:25,678 --> 00:02:27,747

APPLIED TO ME.

84

00:02:27,747 --> 00:02:28,848

NOW YOU'VE SEEN NEWTON'S

85

00:02:28,848 --> 00:02:30,750

THIRD LAW IN SPACE.

86

00:02:30,750 --> 00:02:32,852

NOW TEST IT OUT ON EARTH.