
WHAT IS A
NEUTRON
STAR
?

1
00:00:00,010 --> 00:00:04,070
Text on screen: What is a neutron star?

2
00:00:04,070 --> 00:00:06,080
When a star bigger

3
00:00:06,080 --> 00:00:08,110
and more massive than the sun

4
00:00:08,110 --> 00:00:10,150
runs out of fuel at the end of its life,

5
00:00:10,150 --> 00:00:12,190
its core collapses while the outer

6
00:00:12,190 --> 00:00:14,210
layers are blown off in a

7
00:00:14,210 --> 00:00:16,250
supernova explosion

8
00:00:16,250 --> 00:00:18,270
What's left behind

9
00:00:18,270 --> 00:00:20,310
depends on the star's original mass.

10
00:00:20,310 --> 00:00:22,360
A star roughly 10 to

11
00:00:22,360 --> 00:00:24,380
20 times our sun

12
00:00:24,380 --> 00:00:26,400
leaves behind a neutron star.

13
00:00:26,400 --> 00:00:28,450

A more massive star

14
00:00:28,450 --> 00:00:30,490
becomes a black hole.

15
00:00:30,490 --> 00:00:32,540
Unlike black holes, neutron stars

16
00:00:32,540 --> 00:00:34,600
are directly observable, usually

17
00:00:34,600 --> 00:00:36,650
as pulsars - the lighthouses of the

18
00:00:36,650 --> 00:00:38,700
cosmos. Discovered

19
00:00:38,700 --> 00:00:40,760
50 years ago, they are the

20
00:00:40,760 --> 00:00:42,810
densest observable objects in the

21
00:00:42,810 --> 00:00:44,880
universe.

22
00:00:44,880 --> 00:00:46,920
Neutron stars compress up

23
00:00:46,920 --> 00:00:48,970
to twice the sun's mass into a

24
00:00:48,970 --> 00:00:51,050
city-sized sphere. Matter is

25
00:00:51,050 --> 00:00:53,070
packed so tightly that a teaspoon

26
00:00:53,070 --> 00:00:55,100
of neutron star interior

27
00:00:55,100 --> 00:00:57,110
would weigh more than a billion tons

28
00:00:57,110 --> 00:00:59,130
on Earth.

29
00:00:59,130 --> 00:01:01,140
Still, the nature of the ultra-dense matter

30
00:01:01,140 --> 00:01:03,170
in the cores of neutron stars

31
00:01:03,170 --> 00:01:05,180
is unknown.

32
00:01:05,180 --> 00:01:07,200
Because neutron stars

33
00:01:07,200 --> 00:01:09,230
pack so much mass into such a

34
00:01:09,230 --> 00:01:11,250
tiny volume, they produce

35
00:01:11,250 --> 00:01:13,280
gravity strong enough to bend the light they emit,

36
00:01:13,280 --> 00:01:15,320
distorting their appearance in

37
00:01:15,320 --> 00:01:17,350
a way that enables the mass

38
00:01:17,350 --> 00:01:19,380

and size of the star to be measured.

39
00:01:19,380 --> 00:01:21,410
Scientists cannot

40
00:01:21,410 --> 00:01:23,440
reproduce the extreme conditions

41
00:01:23,440 --> 00:01:25,480
in and around neutron stars on

42
00:01:25,480 --> 00:01:27,520
Earth. They must look

43
00:01:27,520 --> 00:01:29,570
into the galaxy to answer decades-old

44
00:01:29,570 --> 00:01:31,600
questions about extreme matter and

45
00:01:31,600 --> 00:01:33,600
gravity.

46
00:01:33,600 --> 00:01:35,640
NASA's Neutron star Interior

47
00:01:35,640 --> 00:01:37,660
Composition Explorer mission,

48
00:01:37,660 --> 00:01:39,710
or NICER, will make X-ray

49
00:01:39,710 --> 00:01:41,750
observations of neutron stars from its

50
00:01:41,750 --> 00:01:43,780
perch on the International Space Station.

51
00:01:43,780 --> 00:01:45,820
It will give astronomers more

52
00:01:45,820 --> 00:01:47,870
insight into these mysterious

53
00:01:47,870 --> 00:01:49,920
objects - helping determine

54
00:01:49,920 --> 00:01:52,120
what is under their surface.

55
00:01:52,120 --> 00:01:54,360
A multipurpose

56
00:01:54,360 --> 00:01:56,580
mission, NICER includes a

57
00:01:56,580 --> 00:01:57,810
technology demonstration called SEXTANT.

58
00:01:57,810 --> 00:01:59,910
It will analyze NICER's

59
00:01:59,910 --> 00:02:02,090
observations to validate the use of

60
00:02:02,090 --> 00:02:04,170
rapidly rotating neutron stars

61
00:02:04,170 --> 00:02:06,370
as navigation beacons, for travel

62
00:02:06,370 --> 00:02:08,600
in deep space, throughout the solar