1
00:00:03,000 --> 00:00:08,000
NuSTAR will be the very first high energy X ray telescope that can actually focus.

2
00:00:08,000 --> 00:00:15,000
That'll make it make images that are 10 times crisper, sharper than anything that's been made in this part

3
00:00:15,000 --> 00:00:20,000
of the electromagnetic spectrum before. A whole new window on the high energy Universe

4
00:00:20,000 --> 00:00:27,000
-- observing objects glowing in radioactivity -- phenomena like exploding stars,

5
00:00:27,000 --> 00:00:31,000
from very massive black holes to black holes that are about the mass of the sun,

6
00:00:31,000 --> 00:00:35,000
to the atmosphere of our own sun.

7
00:00:35,000 --> 00:00:40,000
For the same reason dentists and doctors use them to study what's going on inside you, NuSTAR

8
00:00:40,000 --> 00:00:46,000
will use these high-energy X-rays to study what's going on near super-massive black holes.

9
00:00:46,000 --> 00:00:53,000
One of NuSTAR's main scientific goals is to get a full census of black holes in the universe.

10
00:00:53,000 --> 00:00:59,000
NuSTAR will be a black hole hunter in the sense that it can point up in the sky and

11
00:00:59,000 --> 00:01:05,000
find black holes even if they're in galaxies hidden behind shrouds of dust and gas.

12
00:01:05,000 --> 00:01:12,000
X-ray telescopes look something like a whole bunch of coffee cans all nested inside one another.

13
00:01:12,000 --> 00:01:17,000

Each coffee can intercepts some part of the incoming X-ray beam

14
00:01:17,000 --> 00:01:24,000
and deflects it to focus it on this detector 10 meters away.

15
00:01:24,000 --> 00:01:28,000
An amazing discovery of the last 20 years is that every galaxy

16
00:01:28,000 --> 00:01:34,000
-- like our own Milky Way -- has a massive black hole at its heart, and as material from this galaxy,

17
00:01:34,000 --> 00:01:42,000
dust and gas, falls onto this central black hole, it radiates and we can see that.

18
00:01:42,000 --> 00:01:48,000
So if we look at the sky in visible light, we see stars. If we look at the sky in X-rays we see black holes.

19
00:01:48,000 --> 00:01:53,000
One of the measurements NuSTAR will make is how fast black holes are spinning.

20
00:01:53,000 --> 00:02:01,000
So, much like a roller skater or ice skater is spinning with her arms out and they bring their arms in

21
00:02:01,000 --> 00:02:06,000
and they start spinning faster and faster, material --as it falls in on a black hole --

22
00:02:06,000 --> 00:02:11,000
starts spinning faster and faster as it gets closer into the black hole.

23
00:02:11,000 --> 00:02:20,000
When two black holes merge, all of that rotation will end up in a single object, making it spin very fast.

24
00:02:20,000 --> 00:02:26,000
NuSTAR is going to measure how fast black holes are spinning, which gives us information about how the

25
00:02:26,000 --> 00:02:32,000
black holes formed and what role they play in the formation of galaxies.

26
00:02:32,000 --> 00:02:37,000
I think for me the most exciting thing is to have this new window on the universe.

27
00:02:37,000 --> 00:02:46,000
It enables astrophysicists to study some of the most energetic phenomena in the universe: the hottest objects,

28
00:02:46,000 --> 00:02:53,000
regions where particles are moving very close to the speed of light behind screens of dust and gas.

29
00:02:53,000 --> 00:02:56,000
Well, the big excitement is that we might see things that are unexpected.