

Building the Coolest X-ray Satellite

Chapter 2 Script

Chapter 2: X-ray Spectroscopy and Collaborating Across the Globe

Chapter 2, Part 1: What is X-ray Spectroscopy?

Video

TEXT: THE XRS INSTRUMENT
CLIPS OF CLEAN ROOM WORK ON THE XRS

Audio

NARRATIVE: ASTRO-E2's primary instrument, the X-ray Spectrometer, or XRS, is being built here at NASA's Goddard Space Flight Center.

Video

KEVIN OC
TEXT: KEVIN'S TITLE
GRAPHIC: X-RAY SPECTRUM PLOT
ANIMATION SHOWING THE ELECTROMAGNETIC SPECTRUM

Audio

KEVIN: The XRS is primarily a spectrometer. And that is to say, it looks at the spectrum of photons that comes from a given source. The spectrum will tell you how hot it is, what it's made of, how fast it's moving. So, if you put light through a prism, you get a spectrum of colors – same thing is true of x-rays. There's higher energy – shorter wavelength and lower energy – longer wavelength.

Video

ANIMATION OF ASTRO-E2 IN SPACE
TEXT: WHAT IS X-RAY SPECTROSCOPY?

Audio

NARRATIVE: How can x-ray spectroscopy help us understand an x-ray source in space? Think about it like this.

Video

ILANA OC
TEXT: ILANA'S TITLE
CLIP OF WHITE BOARD DRAWING OF STADIUM AND BALLS FLYING OUT
TEXT: GAME=PHENOMENON
TEXT: BALLS=PHOTONS

ANIMATION OF CHANDRA X-RAY TELESCOPE IN ORBIT
IMAGES OF SUPERNOVA REMNANTS

Audio

ILANA: So, there is a stadium and people are playing different games in it, and they are using different balls. And the guy or the woman is standing there outside, and then from time to time they get a ball and they look at the ball and they know what game is played. Spectroscopy is this: Is the ability of telling what are the different phenomenon that occur, say your stadium is like a black hole or near a black hole. And each, let's say each phenomenon in physics is going to be a different game. And so you want to know what are the games that are played, so you want to get the balls. Okay? So, let's say that you get a football and you say okay well they are playing football – well you don't know where they are playing football. So now you need something, which is a good imaging, which is Chandra. Chandra is going to tell you, Oh I know, because if I do an image of the stadium, I know where they are playing football, they are playing football right here in that corner of the stadium.

Video

CLIP OF XRS IN THE CLEAN ROOM

Audio

NARRATIVE: The x-ray spectrometer is so sensitive it can detect extremely subtle differences between individual x-ray photons.

Video

CLIP OF ILANA PLAYING FOOSBALL

ILANA OC

CLIPS OF A PING PONG BALL AND BURNED FOOSBALL

GRAPHIC: FOOSBALL, BURNED FOOSBALL, PING PONG BALL

Audio

ILANA: If you play foosball like I do, which is a lot. I'm a pro; I'm a total pro. You can actually play foosball with a ping pong ball if you don't know how to play foosball, but you can also play foosball with a real foosball which you have burned, so that they have a better, you know, a better grip. This is a trick for pro only. The game is really, to have an instrument, which is good enough to tell you the difference between the burned foosball, the non-burned foosball, and the Ping-Pong ball. Astro-E2 is going to tell you the difference between those 3.

Chapter 2, Part 2: Collaborating Across the Globe

Video

SPLIT SCREEN SHOWING CLIPS OF WORK IN THE USA AND WORK IN JAPAN

Audio

NARRATIVE: Work on ASTRO E2 is happening at the NASA Goddard Space Flight Center and in Japan simultaneously. This requires members of each team to travel between Japan and the United States to ensure that hardware and software components are compatible.

Video

MONTAGE OF TRAVEL CLIPS: AIRPLANE, AIRPORT, TRAIN

Video

CLIPS OF AMERICAN AND JAPANESE WORKING IN JAPAN
KEVIN OC

Audio

KEVIN: One of the things I really like about this project is working with the Japanese. They're some very hard working people over there; they're a lot of fun.

Video

CLIPS OF JULI, KEVIN, TAE, AND RYUICHI SHOPPING
CLIPS OF CITY STREET
CLIPS OF WORK IN JAPANESE CLEAN ROOM

Audio

NARRATOR: These trips also offer the chance to see old friends again. Yet, working with colleagues on the other side of the Earth can be challenging at times – especially when you have two very different cultures working together.

Video

GRAPHIC: RYUICHI FUGIMOTO INFO
RYUICHI OC
CLIP OF WORK AT ISAS
TEXT: ISAS: INSTITUTE OF SPACE AND ASTRONOMICAL SCIENCE,
JAPAN

Audio

RYUICHI: We have completely different cultures, customs and systems but we are working for the XRS on board ASTRO-E2. We have the same goal.

Video

CLIP OF BUSY TRAIN STATION

Audio

NARRATOR: Communications can be slow when dealing with a 14-hour time difference.

Video

CLIP OF WORK AT ISAS
CLIPS OF CURTIS, KEVIN AND ILANA AT THEIR COMPUTERS
TEXT: JAPAN IS 14 HOURS AHEAD OF U.S. DAYLIGHT TIME
KEVIN OC

Audio

KEVIN: We do a lot of e-mailing. So, of course you can get only one round of e-mail a day because most of them are asleep over there when you send it and they answer it during the day and come back the next day.

Video

CLIP OF SIGNS ON JAPANESE BUILDINGS

Audio

NARRATOR: Then, there is the language barrier...

Video

CURTIS OC
CLIP OF WORK AT ISAS

Audio

CURTIS: Our counter-parts, almost all of them speak English at some level and that was really good for us because very few of us speak any Japanese.

Video

TAE OC
TEXT: TAE FURUSHE INFO

Audio

TAE: When I was in the US I learned a lot. Cause, they all speak English only, they don't speak Japanese, so I had to learn English.

Video

CLIPS OF JULI, KEVIN, TAE, AND RYUICHI ON A JAPANESE CITY STREET

Audio

NARRATOR: Sampling the cuisine can be fun.

Video

CLIPS OF JULI, KEVIN, TAE, AND RYUICHI EATING AT A JAPANESE RESTAURANT

Audio

KEVIN: I really like sushi. And there's various other kinds of food I like a lot.

Video

JULI OC
TEXT: JULI LANDER INFO
CLIP OF JULI EATING

Audio

JULI : It's like a fish potato chip.

Video

CLIPS OF JULI, KEVIN, TAE, AND RYUICHI ON A JAPANESE CITY STREET
RYUICHI OC

Audio

RYUICHI: What surprised me most is that you Americans eat sweets at the end of lunch or dinner. That's very surprising for me. In Japan I thought, I think that sweets are for children or women not for men.