1
00:00:00,000 --> 00:00:05,020
[Music throughout] [XMM-Newton]

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00:00:05,040 --> 00:00:08,980
[Launched on December 10, 1999,]

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00:00:09,000 --> 00:00:13,020
[XMM-Newton is an ESA (European Space Agency) X-ray telescope supported by NASA.]

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00:00:13,040 --> 00:00:17,020
[It has revolutionized the study of high-energy phenomena in the universe.]

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00:00:21,000 --> 00:00:24,980
France Cordova: The longevity of XMM was not foreseen, it just kept

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00:00:25,000 --> 00:00:29,020
right on going. Stephanie LaMassa: Something about looking at the night sky that just

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00:00:29,040 --> 00:00:32,980
fills you with a sense of wonder and I just never grew up from that.

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00:00:33,000 --> 00:00:37,020
Lisa Winter: XMM has been a part of my career from

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00:00:37,040 --> 00:00:40,980
the earliest stages even until now.

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00:00:41,000 --> 00:00:45,020
LaMassa: XMM is a space-based observatory that studies X-ray

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00:00:45,040 --> 00:00:48,980
light from the most energetic phenomena in the universe. It spans

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00:00:49,000 --> 00:00:53,020
[Stephanie LaMassa, Astronomer, Space Telescope Science Institute. Ph.D. thesis based on XMM-Newton da

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00:00:53,040 --> 00:00:56,980

stars and exoplanets around those stars to the most distant universe.

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00:00:57,000 --> 00:01:00,980
[Norbert Schartel, XMM-Newton Project Scientist, ESA] We can start with comets, which are very cold objects.

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We go then to compact objects where we observe

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00:01:05,000 --> 00:01:08,980
very hot plasma near to the event horizon from a black hole.

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00:01:09,000 --> 00:01:13,020
And then, completely different then we look in

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00:01:13,040 --> 00:01:17,020
XMM-Newton data for signature of dark matter, and this

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00:01:17,040 --> 00:01:20,980
I think makes this mission so great, that it allows such a

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00:01:21,000 --> 00:01:25,020
broad science to be addressed. Cordova: I had a sabbatical

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00:01:25,040 --> 00:01:28,980
in 1982 in the United Kingdom,

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00:01:29,000 --> 00:01:32,980
and my officemate at the time was Steve Kahn. We had a

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00:01:33,000 --> 00:01:37,020
third office mate it was Keith Mason. We came up with the

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00:01:37,040 --> 00:01:41,020
[France Cordova, Director, National Science Foundation (NSF) Was co-PI of XMM-Newton Optical/UV Monitor

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00:01:41,040 --> 00:01:45,020
observations from space. To do deep X-ray

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00:01:45,040 --> 00:01:49,020
imaging and spectroscopy and simultaneously

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00:01:49,040 --> 00:01:53,020
be able to observe cosmic sources in the ultraviolet

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00:01:53,040 --> 00:01:57,020
and optical bands. If we could do all this from

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00:01:57,040 --> 00:02:01,020
one platform in space, namely XMM, we

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00:02:01,040 --> 00:02:05,020
it would be much more efficient. Then, when the X-rays saw something

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00:02:05,040 --> 00:02:08,980
pop off, the ultraviolet/optical telescope would be right there

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00:02:09,000 --> 00:02:13,020
seeing it right away. [Lisa Winter, Astronomer, NSF. Ph.D. thesis based on XMM-Newton data] XMM-Newton is

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00:02:13,040 --> 00:02:17,020
a really fantastic telescope. It’s more than just one telescope

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00:02:17,040 --> 00:02:20,980
actually. You can study the same object across a range

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00:02:21,000 --> 00:02:25,020
of energies from the optical, where we can observe from

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00:02:25,040 --> 00:02:28,980
the Earth, up into the UV and X-rays where you really have to go

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00:02:29,000 --> 00:02:33,020
above into space. Cordova: It was great to be at the beginning

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00:02:33,040 --> 00:02:37,020

of multiwavelength astronomy. There's

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00:02:37,040 --> 00:02:41,020
virtually no cosmic sources that just radiate at

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00:02:41,040 --> 00:02:45,020
one frequency, and when you look at the universe with X-ray

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00:02:45,040 --> 00:02:48,980
eyes you see something much different than when you look at the same universe in

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00:02:49,000 --> 00:02:52,980
ultraviolet eyes. Steve Kahn: I led the US piece of one

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00:02:53,000 --> 00:02:57,020
[Steve Kahn, Professor, SLAC National Accelerator Lab. Was co-PI of XMM-Newton Reflection Grating Spectr

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00:02:57,040 --> 00:03:01,020
Grating Spectrometer. I developed the initial

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00:03:01,040 --> 00:03:05,020
concept for that in the early 1980s when I was quite young.

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00:03:05,040 --> 00:03:09,020
We knew that many systems in the universe emitted X-rays copiously, but

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00:03:09,040 --> 00:03:13,020
we didn't have very detailed models for how that X-ray emission

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00:03:13,040 --> 00:03:17,020
arises and what it was actually telling us about the systems.

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00:03:17,040 --> 00:03:21,020
[Maurice Leutenegger, Astronomer, NASA's Goddard Space Flight Center. Was XMM-Newton RGS team mem

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00:03:21,040 --> 00:03:25,020
but it's

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00:03:25,040 --> 00:03:29,020
more than that because atoms are peculiar. When they shine they don't

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00:03:29,040 --> 00:03:32,980
just give you all the colors of the rainbow, it looks more like

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00:03:33,000 --> 00:03:37,020
a barcode. Kahn: You get very sharp peaks at very particular

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00:03:37,040 --> 00:03:40,980
wavelengths and frequencies and those are associated with particular

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00:03:41,000 --> 00:03:45,020
quantum states. Leutenegger: It’s extremely powerful, it’s just like a barcode, it

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00:03:45,040 --> 00:03:49,020
looks like a bunch of garbage to human eyes but it can tell you

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00:03:49,040 --> 00:03:52,980
you know, what’s in a product, and how much it costs, and what country it came from, and all that stuff.

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00:03:53,000 --> 00:03:57,020
Kahn: By measuring that detailed pattern we can learn about the

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00:03:57,040 --> 00:04:01,020
fundamental physics of what’s happening in these very exotic environments. What the

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00:04:01,040 --> 00:04:05,020
temperatures are, the densities, the pressures. The spectroscopy that

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00:04:05,040 --> 00:04:08,980
XMM-Newton did really answered a huge number of questions.

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00:04:09,000 --> 00:04:12,980
Dheeraj Pasham: With the most recent result with XMM we were

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00:04:13,000 --> 00:04:16,980

[Dheeraj Pasham, Einstein fellow, MIT. Ph.D. thesis based on XMM-Newton data] able to measure the spin of

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00:04:17,000 --> 00:04:20,980
so that I put it on a cup and I drink from it every day, so. (laughs)

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00:04:21,000 --> 00:04:24,980
Schartel: My son was shocked that other people

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00:04:25,000 --> 00:04:29,020
in the school were knowing XMM-Newton.

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00:04:29,040 --> 00:04:32,980
Small children from 10 years, that they know that XMM-Newton

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00:04:33,000 --> 00:04:37,020
is X-ray satellite. Cordova: Ah, you know, it's amazing. It's like

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00:04:37,040 --> 00:04:40,980
the Cal Ripkin of satellites, of space satellites, this

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00:04:41,000 --> 00:04:44,980
thing that just keeps going and going and going and producing great data.

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00:04:45,000 --> 00:04:48,980
Kahn: I'm delighted to see that number one the mission

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00:04:49,000 --> 00:04:53,020
is still working and the instrument is stilling working and that there are

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00:04:53,040 --> 00:04:56,980
all these young scientists that have been inspired to figure out great things to do with it.

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00:04:57,000 --> 00:05:01,020
Cordova: And they're using it for, in all sorts of ways, which is

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00:05:01,040 --> 00:05:04,980
really amazing to see a telescope used in ways and for

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00:05:05,000 --> 00:05:08,980
discoveries that you could never have predicted when you first were

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00:05:09,000 --> 00:05:13,020
designing it and launching it. LaMassa: There's certain science that

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00:05:13,040 --> 00:05:17,020
XMM can do that other X-ray observatories

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00:05:17,040 --> 00:05:21,020
can't. Recently XMM has invested lots of

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00:05:21,040 --> 00:05:24,980
time in these large-area multiwavelength survey

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fields including work that I've been leading, in a region

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00:05:29,040 --> 00:05:33,020
of the sky that has lots of existing data.

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00:05:33,040 --> 00:05:36,980
And that multiwavelength data is really important to harness the best scientific

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00:05:37,000 --> 00:05:41,020
results out of XMM. Pasham: Astronomy is going through a revolution.

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00:05:41,040 --> 00:05:45,020
There's gravitational waves detected, there's several kinds of weird

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00:05:45,040 --> 00:05:49,020
supernovae detected, and having an X-ray instrument to

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00:05:49,040 --> 00:05:52,980
simultaneously operate while these optical instruments are operating

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00:05:53,000 --> 00:05:56,980

will be extremely beneficial. Winter: Many objects change — they have

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00:05:57,000 --> 00:06:01,020
flares and outbursts — so it’s really a key

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00:06:01,040 --> 00:06:05,020
observation to have everything from the X-ray, the optical,

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00:06:05,040 --> 00:06:08,980
and the UV all precisely at the same time.

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00:06:09,000 --> 00:06:13,020
Cordova: I’m so glad that XMM is a part of that, that it was

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00:06:13,040 --> 00:06:16,980
taking people originally into the directions

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00:06:17,000 --> 00:06:21,020
of the time, and today is taking people into entirely new directions.

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00:06:25,000 --> 00:06:29,020
[XMM-Newton 20 years]

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00:06:29,040 --> 00:06:33,020
[and looking forward]