Episode -3: **Your Attention Requested**

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Travis: Welcome to show number negative three of slacker astronomy; a podcast about astronomy and just about anything else that floats over our heads.

Pamela: Every week or so we will bring you a summary of a recent news event from the world of astronomy. And during slow news weeks, we'll simulcast the Howard Stern show. You know, for ratings...

Travis: But this week's show is about big, bad space. Big, bad, EMPTY space. The kind of space that exists in W's head.

Pamela: Or so it often seems. W's victory in November shows that he is actually pretty smart. And recent events show that outer space is not as empty and as tranquil as it generally appears.

Travis: When we look up at the black night sky we see a lonely wasteland of isolated stars. It may feel as if our planet is alone and adrift in an empty Universe.

Pamela: What most of us don't realize is the same sky that looks relaxed and calm is in fact fiery and active. Stars are exploding, galaxies are colliding and even the soft little gas clouds in nebulas are shooting microwave lasers at us. The Universe is alive and kicking, and sometimes it just screams for attention.

Travis: On December 27, 2004 an explosion blasted through space so strong that 12 satellites that are normally tasked to do other things picked it up. It affected our radio traffic and its shockwave even bounced off the Moon and came back to hit the Earth from behind.

Pamela: The explosion occurred about 50,000 light years away on the other side of the galaxy. This means it happened about 50,000 years ago, about the time the first humans entered Europe and North America, and Dick Clark was born.

Travis: The energy from the explosion had to cross great distances and even went through the center of the galaxy which is chock full of dust, gas and other debris. To still be detected through all of that meant the explosion had to be very powerful. In fact, it is now believed to have been the most powerful explosion ever detected. In a few seconds the explosion released as much energy as the Sun releases in a quarter of a million years.

Pamela: The source of the explosion was a neutron star. Neutron stars are the leftovers of stars that have exploded as supernova. The supernova explosion blows away all the layers of the star leaving a tiny core of material about the size of a large city. This core is made up only of neutrons, which normally sit in the center of atoms with protons. A neutron star is very dense; a teaspoon full of neutron star material would weigh as much as the Earth.

Travis: Some neutron stars spin very rapidly after they are formed. You know how ice skaters spin faster when they pull in their arms? Well the same thing happens to stars when they suddenly get very small: they go from taking tens of days to rotate to taking tenths or hundredth of a second to rotate. This spinning sometimes teams up with the star's incredible density to create wicked strong magnetic fields. That type of neutron star is called a magnetar.

Pamela: Magnetars are a pretty recent discovery in astronomy. First identified in 1998, they are now one of the sexiest objects for astronomers to study. They have it all, magnetic fields, high rotation rates, explosive origins, and mood swings punctuated with high-energy gamma ray.

Travis: Sometimes the magnetic field in magnetars gets twisted up like a tangled ball of rubber bands. Eventually it gets so twisted that the field lines break and release their energy in a giant explosion. That explosion isn't shaped like a ball. Instead it follows the leftover magnetic field lines and shoots out in two beams away from the North and South Pole of the magnetar. In this case, one of those beams was pointed right at the Earth.

Pamela: Or, more accurately, where the Earth would be waiting 50,000 years after the explosion.

Travis: The explosion was detected on board many satellites as a wave of gamma rays and x-rays washed over them. Some of these satellites were studying the Sun, some were studying planets, some were studying the Earth and some had commercial purposes. None of them were looking for a magnetar. This explosion was so bright that they couldn't avoid detecting it.

Pamela: One satellite was pointing the opening to its detector somewhere else in space during the explosion. The magnetar's burst was so bright that its energy went through the *side* of the spacecraft and hit the detector. We weren't kidding when we said this magnetar demanded attention.

Travis: My ex-girlfriend did that when I watched TV while she was talking to me.

Travis: As if that wasn't enough, the X-Rays hit the surface of the Moon, bounced off and a Russian satellite studying the Sun detected the echo.

Pamela: So what does this mean for the Earth? Amateur astronomers with the American Association of Variable Star Observers, or AAVSO for short, like to detect X-Ray explosions on the Sun for fun. Hey, beats getting drunk at a bar right?

Travis: No it doesn't.

Pamela: Okay, so it doesn't, but it's still fun detecting X-ray's if you are a geek like me, Travis and Aaron. So these people listen to powerful radio transmitters run by the Navy to talk to submarines. These signals bounce off a layer of the earth's atmosphere that becomes more reflective when exposed to lots of X-Rays. When the atmosphere is more reflective, the signals from the transmitters become stronger. This change in signal strength is called a sudden ionospheric disturbance.

Travis: Something similar happened when the X-Rays from the magnetar explosion hit the Earth's atmosphere. They made part of the atmosphere reflect the radio waves more efficiently. This was detected by the amateurs, most of whom were in North America at the time and listening to transmitters in Maine, Washington state and Hawaii.

Pamela: With some much satellite and atmospheric chaos going on, you may be wondering - could this explosion have hurt us? Not really. The magnetar would have to be a lot closer to the Earth to be strong enough to penetrate our atmosphere, which has 5 billion years of practice protecting us from things that go flare in the night.

Travis: But it is possible that such an explosion caused at least one of the mass extinction events in our historical record. It is estimated that such an explosion of gamma rays would occur close enough to the Earth to affect us about every few hundred million years, which just happens to be the same interval geologists have set for mass extinction events.

Pamela: Space explosion induced mass extinction is interesting to think about, but it is a complicated story that we'll save for another time. Perhaps Halloween when you want to be creeped out. For now, just remember: The Earth is overdue for another mass extinction.

Travis: ...And that wraps up this episode of Slacker Astronomy. After you are done buying your tin foil hats and SPF 1 million sunscreen log onto our site at slackerastronomy.org for our show notes. You can post feedback there or send it to info@slackerastronomy.org.

Pamela: This was our 3rd podcast ever. We plan to experiment with our content, style and format for about a month before officially launching the site in March. Now is a good time to give us feedback.

Travis: Also on that site you'll find our “Introductory Welcome” podcast with the 3 of us blabbering on for 9 minutes about unicorns with lasers on their horns and matchmaking. Check it out to find out what this podcast is all about - which is obviously not perfection.

Pamela: I'm Pamela Gay and on behalf of Travis and Aaron thanks for listening and no, you don’t get your four point five minutes back.

Travis: Clear Skies and Clear Bandwidth. This has been Slacker Astronomy, a volunteer collaboration for you, for fun, for the voices in our heads.