

Episode 16: **Your Attention Requested**

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Written by: *Aaron Price*

Disembodied Voices: *Phantom Australian & Pamela Gay*

Engineering & Production: *Aaron Price*

Pamela: Welcome to Slacker Astronomy. Every week we bring you a podcast covering a news event from the world of astronomy. And when there is nothing to report, we'll continue our work on the sexy astronomers 2006 calendar.

This week Travis Searle is on a much needed vacation. We expect him back for the next show. In his place we have the Phantom Australian. She represents one 20 millionth of the Australian population. Which makes her twice as smart as the entire American population combined.

PA: Oh, come on now. Don't be silly. Twice as much?

Pamela: Yeah I think that sounds about right.

PA: I think ten times as much is closer to the truth.

Pamela: Don't let it be said Australians don't know how to take compliments.

PA: I'll be more than happy to sit here and let you admire me. But I think your listeners want a show.

Pamela: And this is a show we've looked forward to. We've got a new discovery about one of the most beautiful objects in our solar system.

PA: Russell Crow?

Pamela: No. This one is in space.

PA: Oh, Nicole's ex - Tom Cruise!

Pamela: Saturn's rings!

PA: Who's that? Another American Boy Band?

Pamela: It very well could be. But what I'm talking about in this case are the wonderful and majestic rings that circle the planet Saturn. Recently astronomers have discovered that the ring system has an atmosphere of its own. The Cassini spacecraft has detected molecules containing two Oxygen atoms that seem to be gravitationally bound to the ring system. This is the same oxygen molecule we breath on Earth, by the way. The oxygen molecules are gravitationally bound to the ring system, which consists largely of tiny grains of silicate, rust and water ice. It is the water ice that feeds the atmosphere.

PA: The regular water molecule is made up of two hydrogen atoms and one oxygen atom. The theory behind creation of this atmosphere is that the hydrogen atoms are stripped from the oxygen atom by ultraviolet or X-Ray light from the Sun. The oxygen atoms later combine to form the detected molecules of pure oxygen.

Pamela: These molecules of neutral Oxygen exist in the ring plane where they are ionized, probably again by sunlight. These ions move outward from the ring

and form an ionosphere of mostly ionized Oxygen. Trace amounts of ionised Hydrogen and Hydrozide also were detected.

PA: In this month's issue of the Astrophysical Journal astronomers announced that they have detected X-rays from the Saturn ring system with the Chandra space telescope. The energy levels of these X-rays correspond with those expected to be generated when sunlight ionizes molecular oxygen. This was welcome confirmation of the existence of the atmosphere.

Pamela: The atmosphere is not much like the one on Earth. For example, it is very tenuous. Cassini measured only 25 electrons per cubic centimeter of space. It is believed that its instrument was sensitive enough to detect 1-10% of what actually existed. So that makes 25 to 250 electrons in this atmosphere. Oxygen molecules normally have 16 electrons each. So for a really simple estimate we're talking only up to about 15 molecules per cubic centimeter.

PA: Compare that to 25 *billion billion* molecules in sea level air pressure on Earth.

Pamela: Unless you are blonde, there just isn't enough air in the ring atmosphere to keep you alive.

PA: The Earth's Moon also has an atmosphere. But it is relatively thick compared to Saturn's ring. It has 10 million molecules per cubic centimeter. Most of it comes from cracks in the rocks that lead to out gassing, the same effect that gives a car that New Car Smell.

Pamela: The rest of the lunar atmosphere comes from the solar wind and from molecules taken from the Earth's atmosphere.

PA: The Moon is a thief!

Pamela: Think of it more like Oliver Twist, begging for whatever scraps it can find. The difference here is that Saturn's rings actually generate their own atmosphere instead of capturing it from other places. It comes from that water ice. Which of course begs the question, what will happen when the ice runs out?

PA: The days of Saturn's rings are indeed numbered.

Pamela: Not only is the ice being evaporated by the Sun but the dust is also precipitating down onto Saturn. While scientists are debating just how long Saturn's rings will be around, everyone agrees the rings are marked for death sometime in the cosmologically not so distant future.

PA: So we're lucky to be around to enjoy them now.

Pamela: The ring system is thought to have formed a few tens to hundreds of millions years ago when most likely a Moon came too close to Saturn. Saturn's gravity then stretched the Moon and destroyed it. This gravitational shredding force is called a tidal force, and it is the same thing that stretches our oceans to cause high and low tides. Basically, if you have a big object like a Moon, the part of the Moon closest to Saturn will feel more gravitational attraction to Saturn than the part of the Moon further away. At some point, when the object get's

too close, this difference is so strong that the Moon is stretched beyond its breaking point.

PA: Think of a ball of bread dough. One person holds the ball and the other person grabs a hunk and slowly starts to walk away. The dough will stretch out into an oblong shape until finally it breaks. This is what happened to the moon of Saturn.

Pamela: What was leftover of the shattered Moon fell into an orbit around Saturn and formed the ring system. The rest of Saturn's Moons exert gravitational effects on the ring system and that is what gives the rings their shapes and gaps in between them. It's a very complex system. But we're thankful. If it wasn't so complex and impermanent, would it be so beautiful?

PA: Buddhist monks like to make art out of colored sand. They can make gorgeous tapestries that rival anything from the classical masters. They travel from city to city making and displaying the art. But after a few days, they pour the sand back into their bottles and destroy the painting forever. Then they move on to the next city and do another one. Why do they do this? Because they understand that we as humans appreciate things more when we know they are impermanent and not going to last. And Buddhists, better than almost anyone, realize the Universe is a constantly changing place.

Pamela: And so it goes with our solar system. As Saturn's rings slowly rain into the Saturnian sky and disappear over the next 100 million years, a new ring system is in gestation elsewhere. Triton, the giant Moon of Neptune, and not to be confused with Saturn's moon Titan, is currently falling into its parent. At some point in the next hundreds of millions to billions of years it too will stretch out and be destroyed by Neptune's tidal forces. Most likely a brand new ring system will be formed around Neptune.

PA: Death and rebirth, impermanence and beauty. This has the makings of an epic tale. We just need some wizards and hobbits and we can make millions.

Pamela: But don't just take our word on it. See Saturn for yourselves. If you look at Saturn with a high-powered pair of binoculars you will be able to see that it doesn't look round. It looks like it has some ears on its side. Those are the rings. You'll also be able to see Titan and some other Moons around Saturn. They look like bright but small specks of light. Go out night after night and you'll notice that they move around the planet.

PA: If you have a small backyard telescope you will be able to separate the rings from the planet. This is one of the most majestic images any astronomer, professional or amateur, can see. Some of the things in space look a little disappointing when see through a small telescope with the naked eye. Not Saturn. We guarantee you will be impressed.

Pamela: Saturn holds up well to urban light pollution also. So even if you live in the city, you have no excuse! If you don't own a telescope or binoculars, contact your local amateur club. They will be happy to show you Saturn and the night sky. Sky and telescope.com has a worldwide listing of amateur clubs on their web site.

PA: The only catch is that Saturn isn't well placed in the sky for viewing right now. You'll need to wait until October for a good glance.

Pamela: By the way, we plan to do an SA-Extra podcast about observing the night sky, how to pick a telescope, use a star chart, etc. sometime in the next couple of months. Stay tuned to the SA-Extra feed by subscribing to it at our web site slackerastronomy.org.

PA: Thanks for tolerating this Aussie invader. Travis, we wish you happiness on your journey, but please hurry home!

Pamela: Thanks for listening to another episode of Slacker Astronomy. I'd like to thank the Phantom Australian for stepping up to the plate and helping out this week.

PA: Stepping up to the plate? I don't get the reference.

Pamela: It's from baseball.

PA: Oh, cricket on steroids. Well I'm glad I could help you Yanks.

Pamela: Yanks? Do you realize the Yankees are a baseball team hated here in Boston?

PA: Ah! Your land is so confusing. I was in Georgia last week and I felt I was in another country.

Pamela: You were.

PA: They have fried chicken intestines and boiled peanuts...

Pamela: Proof that the theory of relativity applies to the food palette as well as quantum physics!

PA: Proof that you American's like fat and salt and sugar on everything!

Pamela: So pass the potatoes chips and send feedback or questions to info@slackerastronomy.org. Archives, show notes and more are at slackerastronomy.org. Also, we're about to launch a slacker astronomy newsletter distributed via e-mail. You can sign up on the front page of our web site.

PA: Not Kangoroos were harmed in the production of this podcast.

Pamela: For the Phantom Australian, a vacationing Travis, our author Aaron and the Chicken Fried Steak of Georgia, this is Pamela Gay. Thanks for listening to Slacker Astronomy, a podcast for you, for fun, for the voices in our heads.

PA: G'day.