

Astronomy Cast Episode 193 Astronomy with the Unaided Eye

Fraser: Astronomy Cast Episode 193 for Monday June 7, 2010, Astronomy with the Unaided Eye. Welcome to Astronomy Cast, our weekly facts-based journey through the cosmos, where we help you understand not only what we know, but how we know what we know. My name is Fraser Cain, I'm the publisher of Universe Today, and with me is Dr. Pamela Gay, a professor at Southern Illinois University Edwardsville. Hi Pamela, how're you doing?

Pamela: I'm doing well... it's so good to be recording in the same month that we're existing in!

Fraser: I know... I know... Yeah, the summer of episodes is grinding on and we're pretty much caught up, and we hope to get ahead because you're going to be travelling like crazy in July.

Pamela: Yes, if you're going to be at TAM, I shall see you at TAM. If you're a scientist and going to be at the NASA lunar forums, I will be at the NASA lunar forums. If you're an educator and you're going to be at the Astronomical Society of the Pacific meeting, I will be at the Astronomical Society of the Pacific meeting. And then both Fraser and I will be at DragonCon...

Fraser: In September...

Pamela: In September... and then both Fraser and I will be at the US Science and Engineering Festival in Washington DC in October.

Fraser: There you go. Ok, so we talk a lot about telescopes here at Astronomy Cast, but you don't really need any special equipment to appreciate what the night sky has to offer. Just head outside with some sky charts, maybe a planisphere, some friends, and hot chocolate, and you're good to go. Let's talk about what kinds of things you can see with just your eyes. And before we did this episode... the real title should be "Astronomy with the ***** Eye," not "Astronomy with the Unaided Eye." But...

Pamela: But there's spam filters...

Fraser: The spam filters! I know! So, this is the thing, right, we say that... we put that as our title, then kids won't be able to access this site because their nanny filters will go off, in fact, whoever's doing the transcript for this...

Pamela: Don't use the word *****.

Fraser: Leave this whole part out... it's not even in there... so, as a web-master, this is one of the sort of little pieces of experience that we've built up is to never use that word when we're talking about astronomy with the unaided eye. So, unaided... meaning no binoculars, no telescope, just your eyeballs enjoying astronomy.

Pamela: And if any of you have problems with nanny filters and my last name... this just occurred to me... some of you may be having that issue. Let us know and we'll figure how to work around it...

Fraser: That's true, yeah. Ok, so... I love doing this. A lot of my favorite part of astronomy is just being able to go out, take some friends outside, show them the constellations, especially when really interesting things are happening. So what kinds of things, like general class of things, can you see just without any telescope, binoculars, anything?

Pamela: The most amazing thing... and this requires going out in the dark somewhere... like really dark... like drive so that you can't see a city on any skylines. Drive to the middle of nowhere, take a tent, take a sleeping bag, take friends, take food and water, and look up in the summer and just absorb the Milky Way.

Fraser: Yeah.

Pamela: It's the most amazing thing. And if you're in the southern hemisphere, the dust lanes through the Milky Way... at one angle it looks like an emu... at another angle it looks like a floppy-eared dog. And you can actually lay there with your friends and spend the entire night going, "And the dust lanes look like..." and just making stuff up like you're looking at clouds.

Fraser: And so what are these dust lanes that we're seeing?

Pamela: Well, it's a combination of... first of all there's this bright stripe through the sky that's the equivalent of where the disk of the Milky Way is. So we live embedded in a pancake of material. And if you can imagine holding a giant 10-foot diameter pancake up with a hole off-center and sticking your head in the hole... where you look around and see pancake, that's the disk of the Milky Way in the sky. Now, just like you can't look all the way through the pancake because there's pancake material, you can't look all the way across the disk of the Milky Way because there's dust. And so when we look out, where we see really bright, it's literally thousands and thousands and thousands of stars packed side by side, lighting up this bright stripe. But there's also lots of dark molecular clouds, lots of cold gas, lots of stuff out there that's just blocking the starlight. And the dark bands through the Milky Way is where it's particularly dusty.

Fraser: So, to see the Milky Way, you definitely have to get out of the city, you have to get, I would say, 30-40 kilometers away from a city to really start see it. We can see it where I live. I live in a city, but it's not a very bright... not a very large city. And still, the Milky Way doesn't look that nice. And if I go a few kilometers out of the city, then things get a lot darker and a lot better.

Pamela: Yeah, where I live in southern Illinois, I can't see it from my house, but I have a horse... an old, mangy-ish... not really, he's very cute... I have an old horse... and the barn where I keep him... if I hang out too late, I can see the Milky Way out there. So, if you have a friend with cows or horses, likely if you're out at their barn and you shut the lights off, you can see the Milky Way.

Fraser: But I think in general, everything that we're going to recommend, the further you get away from the city the better. Whether you're seeing comets, meteor showers, the planets, anything... get away from the city. And also, the later you stay up, the better it gets. So, you know, if you're gonna start to see some stars... 10 o'clock at night... it's a completely different story when it's three in the morning.

Pamela: Yes. And well the other thing with three in the morning is that people shut off all their house lights, so as people go to bed, the sky gets darker and darker as all of the lights get turned off, and you can actually see that in how many stars you can see.

Fraser: Yeah, one thing that I'll do when I take the kids camping is we'll just go to bed at a normal time, but I'll set an alarm and then, yeah... at two in the morning I wake up everybody... I wake up the whole family. And they're like, "I don't want to!" And then I show them the stars and they're like... "Oh, yeah, this is good!" And then if we're watching a meteor showers, etc., then that's what we'll do. Then you can really appreciate it. Then it just blows your mind.

Pamela: And this is the year for the meteor showers, and we're starting to come up on it. I know you're looking forward to August.

Fraser: Yeah, August 2010... so if you're listening to this after that, I'm sorry... you missed out. But August 2010, the Perseid meteor showers are going to be just 2 days away from a new moon, so you're going to have the darkest possible skies, plus you're going to have a triple conjunction... you're going to have three planets very close to the moon... I think it's ~~Jupiter~~ [Saturn], Venus, and Mars are all going to be very close to a crescent moon. And then you're going to have the Perseid meteor shower. So, right now... put on your calendar...

Pamela: August 12-13...

Fraser: August 12-13... the 13th is a Friday, so, you know...

Pamela: You can go out and celebrate your superstition with a doubly superstitious night.

Fraser: Well, no, but also you don't have to work on Saturday so you can stay up really late.

Pamela: Yeah, and they're estimating 60 meteors per hour with this one, which is fairly consistent... and the Perseids often put on a nice bright show.

Fraser: Yeah, really bright one. So, make sure you do that. Find some friends, schedule a time, go camping the 13th of August, 2010... or 12th... it'll be fine. Ok, so we've talked about the Milky Way... what else can we see with just our eyes?

Pamela: Well, it varies with the year. Not with the year... with the time of year. Since we're in summer, we might as well start with summer. One of my other favorite objects to search out... there's two of them actually... the easier one to find is the Andromeda Galaxy. You can actually see it as this fuzzy... wow, is there really something there? Wait, if I turn my eyes sideways... wow, there's something there. If I look directly at it, it kind of disappears. You have to learn how to use your off-center vision to see it best. But, Andromeda actually shows up as something fuzzy the size of a fingernail up on the sky, and that's about as cool as it gets.

Fraser: Isn't that about the most distant thing you can see with the unaided eye?

Pamela: In the northern hemisphere, it's the only galaxy that can be seen by normal people on a regular basis, **** eye, and it just really stands out. It's off the legs of the constellation Pegasus, and it's fairly easy to see. It's going to be a really late-night object this time of the year. Then it gets higher and higher in the sky as we get towards fall. But right now, early in the morning, it's up as a morning object... those of you who see the sun rise, just get up a little bit earlier and it's there waiting for you. The other object, though, that is perfectly high in the sky right now is M13. This is a globular cluster, so it's something that's out of the disk of the galaxy. It's literally a cluster of thousands and thousands of really old stars packed into a tight ball that if you did look through a telescope, would kind of look like a dead bug splattered on the eyepiece. It's in the constellation of the Warrior, and there's just this fuzzy splatter print on the Warrior's chest.

Fraser: That's Hercules, right?

Pamela: It's Hercules... it's in the constellation Hercules.

Fraser: And you can see the Summer Triangle, which is actually made up of three different constellations, but in the summer, it's your go-to constellation first.

Pamela: And it helps you find the Milky Way, because the Milky Way goes right down the center of the Summer Triangle. So the three corner stars are Altair, which is in Aquila, the eagle; Vega, which is in Lyra, which is a type of harp; and then Deneb, which is in Cygnus, the swan. Aquila and Cygnus are both flying along the Milky Way.

Fraser: Right. And so, in the summer anyway, they will be pretty much the three first stars that you see. And then you can watch them over the course of the night as the rest of the constellation fills in. So summer... and then of course in summer, later on in the evening, Perseus comes in quite nicely.

Pamela: Right.

Fraser: Which looks like, from my vantage point anyway, an upside-down V.

Pamela: And between Perseus and Cassiopeia there's the Double Cluster, which is another thing that if you're in a dark, dark, dark, dark site you can sort of go... oh, there's something there.

Fraser: Yeah. Then you look at it and it disappears. Something faint...

Pamela: But Cassiopeia is always striking to look at because it's either this big number 3 or this big W or this big letter M, depending on what time of day it is. And there's people who actually learn how to tell time as a function of where in the year we are by looking at Cassiopeia. It's really neat to take these very linear constellations that are up all night, and watch through the night as they rotate through the sky. You can also do this with the Milky Way in both the northern and the southern hemisphere. As you watch the Milky Way through the night, it will slowly rotate through the sky, which is just fun.

Fraser: And it's the summer right now when we're recording this, but there are other things that look quite great over the course of the year... although it gets colder, anyway for us... to go outside...

Pamela: So just to bring one more thing up as we stay in the summer is that if you live near the equator, you are a lucky soul. The object I'm about to mention can be seen by most of both hemispheres, and that's Sagittarius, the teapot. Although in the southern hemisphere it wouldn't hold any water.

Fraser: Upside-down teapot...

Pamela: Yes.

Fraser: But it sure looks like a teapot... absolutely... no question.

Pamela: Yes, and imagine just taking your little kids out, and you can do the "I'm a Little Teapot" song and show them where on the sky the spout is and the handle is. It's just a neat way to engage little tiny kids in astronomy. And Sagittarius, when you're looking at it, you're looking at the center of our galaxy. You can actually start to figure that out because as you look at the Milky Way, you can see how it's much wider when you're looking at Sagittarius, and then it narrows further away.

Fraser: Right. And then at other times of the year?

Pamela: So, moving into the fall, Orion starts to join us in the sky. We have Andromeda high in the sky overhead, and we're just losing Sagittarius come September... it's a very early evening object and sets very quickly.

Fraser: Orion is coming... Orion is great! I mean, once you learn Orion you'll see Orion's belt, you'll make out the shape of the shoulders, even his shield and sword. And then inside the sword is the Orion Nebula, another one of those blurry spots on the sky.

Pamela: And what's really cool about the fall sky is you can go out and you look at the Orion Nebula, the fuzzy sword, and those are stars that are still in the process of pulling

themselves together. There's going to be supernovae in the future of all these young bright, bright blue stars burning themselves out and exploding, but they're not there yet. The stars are still in the process of forming with the smallest ones. So as you look at Orion, that's a star-forming region. It's going to become an open cluster... cc open cluster in the making, I guess. But then if you just look a little to the west, closer towards the ecliptic, towards the constellation Taurus, the bull. In that general direction, if you keep going past Taurus, the bull, you get to the Pleiades. This is an older open cluster, where all the stars have formed, where almost all the gas has been consumed or blown out. You're now looking at the Subaru car symbol, and you're seeing what Orion will become in the future. The stars are a little bit more spaced out... and it even gets better. If you now go back to Taurus, and you pause at Aldebaran, the big burnt-orange star... University of Texas... symbol is the bull... Taurus is a bull... burnt-orange University of Texas star... can you tell where I got my PhD? This is where the Hyades cluster is. As you're looking at Taurus, there's this over-density of stars that's kind of spread out, and that's what the Pleiades will become in its future. So here we're looking at three different versions of the same object, at three completely different ages. All within a few fists of one another on the sky, this whole set of stellar evolution traced out.

Fraser: And a little later into the winter, we start to get Sirius coming up in the night sky, and that's the brightest star in the night sky.

Pamela: Right. And it's also a star... and you can never make this out with any normal human telescope or your eyes, let alone... Sirius also has a white dwarf companion. So when you're looking at Sirius, you're actually looking at two stars... a normal star and a little white dwarf beside it.

Fraser: And then what about into spring?

Pamela: So, as we get into spring, well now we have Gemini, the twins Castor and Pollux, straight overhead. And Cancer is out, and Cancer... if you're in a dark site and you look at it, there's this triangle of stars that you can just make out. In the center of this triangle of stars is this fuzzy cotton ball. And that fuzzy cotton ball is another cluster—it's M44. And it's just really dramatic in dark-enough skies. When I was down at Sutherland Observatory in South Africa a few months ago, I had to ask somebody, "What's that big bright fuzzy thing over there?" just because it was just so shocking and I hadn't been in skies that dark when Cancer was up. So that's something very dramatic. It's interesting to watch as the year progresses, just seeing how everything changes, because come March, we still have the Pleiades in the sky... we still have Orion... but they're now in completely different places. It's that march of the constellations that a lot of people just don't notice. When you take the time to notice it, every year it's like you get to watch your friends come back in the sky.

Fraser: And those lucky ducks that live in the southern hemisphere have a whole bunch of stuff that we just have no way of seeing in the north.

Pamela: Right. And it's really shocking if you go to a dark site in the southern hemisphere because the Large and Small Magellanic Clouds look like someone took a fist full of Milky Way... tore it off and threw it to the side. Literally it's like a fist on the sky worth of extra stars.

Fraser: Wow. And you can see Alpha Centauri, which is the system that contains the closest star to Earth, which we can't see from the north.

Pamela: And the Tarantula Nebula... now I know this is supposed to be all unaided observing, but the one object that if you're in the southern hemisphere, if you visit the southern hemisphere, if you think about visiting the southern hemisphere, you should go for this reason. If you look through just a 12-inch telescope at the Tarantula Nebula, you're actually looking at the face of a tarantula. It really surprised me... it's just like... big face, staring at you through the eyepiece.

Fraser: So we've talked about some things that we can kind of see all year long, quite dependably. So if you go out in August, you're going to be able to see the Summer Triangle every year. What kinds of resources would you suggest people take to find their way around the sky?

Pamela: The best thing you can possibly do is either print out the monthly sky maps that you can get at skymaps.com. They're good, they're solid, they update them every month... they're free! They tell you where the planets are. One of the things that periodically throws me off is Leo the Lion periodically grows a nose that's just a planet that wandered across the ecliptic. It's good to have sky maps to show you what these strange, mysterious additional stars and constellations are.

Fraser: Yeah, so free... go to skymaps.com, you can print off some free sky charts, and you're set. Or if you want to spend a little money, get a planisphere or even... I like *Nightwatch*... as a book...

Pamela: Yes, *Nightwatch* is good. And there's a yearly... if you love big, beautiful, stunning art, there's a yearly sky calendar that comes out that you can get through Sky and Telescope that is super-sized. It's about 18 inches tall, and just has the most amazing artwork. It updates you on every year's... how good are the meteor showers going to be... The meteor showers can vary a couple of days each year. I was born during the Geminids meteor shower, but it's not every year on my birthday.

Fraser: Right, and this was the second part that I wanted to talk about which is that some things happen on very specific days. These are the meteor showers. You can go out any day in August and see the Summer Triangle... you don't have to be that precise about it. But if you want to see the Perseid meteor shower, then you do have to really go out within a couple of days. So there are meteor showers that you can see... what are some other objects that we can see?

Pamela: Well, one of the neat things to challenge yourself to do each month is to be the first person to see the crescent moon. There is nothing quite as magnificent low on the horizon as a couple-day old moon that is visible only just as the sun is setting. So, that's a fun challenge. Then there are the times when a moon and planets are side by side on the sky. These are just random events that have beauty and you can go out and it's neat to think that I'm looking, right now... at the same time... at Mars, Venus, and the moon. And that's kinda cool. A few years ago Jupiter passed in front of the Beehive Cluster and so you get these merging of different events. Then there's also solar and lunar eclipses as well. We're going to have a partial lunar eclipse coming up on June 26, a solar eclipse coming up on July 11, and another lunar eclipse coming up on December 21. And with these good star charts, they can help you keep attention to when are all of these different things going to happen.

Fraser: And you can also see some stuff that are man-made as well... there's satellites. If you spend any time looking up at reasonably dark skies, you're going to see satellites go overhead. One of the games that we play is "Who's the first person to spot a satellite?"

Then, if you're organized, you can go to the NASA website, and you can find out times when the International Space Station is going to be flying overhead... or the space shuttle... or Hubble.

Pamela: And another good resource to go to that also lets you in on the iridium satellites and random spy satellites and even comets is heavens-above.com. You can put in your location, specify latitude and longitude... Google Maps will help you figure that out... and it will tell you all of the cool stuff with ten days worth of predictions of what is going to be over your place on the planet. And there's for some cities Twitter feeds set up by Rob Simpson of Orbiting Frog, so if you're in New York City, for instance, you can go to Over New York. If you're in Paris, there's Over Paris. There's a whole variety of different cities he's set up, and I think he'll often set up new cities if there's a bunch of people who are interested. These will Twitter at you when a satellite is overhead that you're able to see.

Fraser: Yeah, once again I would really recommend going to the NASA site, find out when the space station's going to be flying overhead. Then schedule a party... schedule a time that you and your friends are going to be outside... you're having a barbeque... then it gets late, and you have the timer go off and you go "Ok everybody... the space station's going to go overhead!" You gather everyone around and you look up and right on cue, this super bright star shows up over the horizon and crosses the sky in about a couple of minutes and it's gone. Everyone will think you're a genius!

Pamela: And there's also just neat things that we can't always predict how cool they're going to be like comet McNaught. Last year comet McNaught just came out of nowhere. No one knew how fabulous this comet was going to be. It's back again this year... it's just barely visible... it's magnitude 5.6... it's hanging out next to Perseus right now. But there's often comets that crop up at least once or twice a year that are easily seen with unaided eyes, and it's just really cool to go out and see these pieces of ice that might have originated in another solar system.

Fraser: Yeah, and once a decade you'll get a comet like Hale-Bopp or Hyakutake. And with those, you've really got to get organized and get out of town, and see that with dark skies. A friend of mine and I went on a road trip to get out of Vancouver to see Hale-Bopp and it was just astonishing to see that comet on the horizon.... just amazing.

Pamela: And comet Hale-Bopp is one that when it was up, you looked at it and it was a large chunk of your windshield. And then when Hyakutake was out, I was observing at McDonald Observatory and I remember that it just happened to always be in my windshield when I was driving toward the observatory, so I felt like I was following the comet to the observatory. It was literally half my windshield wide looking at it and just hung low over the horizon, truly magnificent objects, but they only come around every few years. So keep an eye out for when they're around and then just go absorb the experience.

Fraser: And I would also recommend getting to know when some planets are in the sky. We'll usually announce some really interesting stuff on Universe Today, but there's other sites as well. You can say... ok, and get to know... then you see the really bright Venus on the horizon or even high up in the sky even a few hours after the sun's gone down. Then you just tell people. I will point a person towards Venus and say "Hey, did you know that's Venus?" And they're like... whoa, I didn't realize that I could see Venus... and then "Yeah, and there's Jupiter over there." If it's off to the west in the evening, it's probably

Venus. If it's high up in the sky and it's bright, it's probably Jupiter. They're the first things to show up. If it looks quite red, it's probably Mars.

Pamela: And because Fraser and I both know the email is coming again... you will, at some point in the coming months as Mars rounds its way back around the sun, get the email—and Fraser knows what I'm about to talk about—saying that Mars appears bigger than the moon. That will never happen. So when your friends send this to you... you, too, can laugh at them, and then take them out and actually look at Mars, because Mars is cool to look at. It is so amazingly red and most people just don't realize that you can actually see colors in the stars... and there's reds and there's blues and you do see the color... except for green—there isn't green.

Fraser: And there's a little bit of astronomy that you can do during the day... which is that you can observe the sun but...

Pamela: And the moon...

Fraser: And the moon. That's true, but you can observe the sun, just don't use your eyeballs directly. But, you can use a pinhole projector to project the disk of the sun onto the white piece of paper, and you can actually see sunspots. But don't look with your eyes... don't look with your eyes!

Pamela: Resist the temptation...

Fraser: Yeah. Well, that was great, Pamela, I think we... is there anything else that we can see?

Pamela: I think we hit the highlights. Go out and fall in love with the stars.

Fraser: So, right now, schedule the Perseids on August 12-13... get some friends together... do a sleepover... stay out late... leave the city... go camping...

Pamela: Remember bug spray... remember bug spray...

Fraser: Sure... and see the Perseids because you'll remember it your whole life.

Pamela: And we'd love to hear your experiences on the BAUT forums where we have the Astronomy Cast pages.

Fraser: That would be great. Or, just send us an email, and that would be great. Alright, well thanks a lot, Pamela. And I'll see you outside!

Pamela: Yes! Sounds good, Fraser. I'll talk to you later.