

## AstronomyCast Episode 251 for Monday, February 6, 2012: Messier Objects

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Fraser: Welcome to AstronomyCast, 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 are you doing?

Pamela: I'm doing well. How are you doing, Fraser?

Fraser: I'm doing well. The weather's starting to improve -- things are getting nice and sunny. I'm good.

Pamela: You know, Spring in January is just plain wrong, Spring in February is still mostly wrong, but yeah, I have to admit my bulbs are starting to come up, so this is a very odd year.

Fraser: That's good. Alright, so have you ever looked into the sky and noticed a fuzzy blob? That's a Messier object, carefully catalogued by Charles Messier to make it easier to find comets. We'll learn about the history of the catalog, Messier's criteria and some of the prominent objects you might see.

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Fraser: Alright, Pamela, so I've done this. I've rediscovered many of the Messier objects all on my own -- I used to do that. I would go outside look up, you know, really dark skies, and where I grew up we had just beautiful dark skies, great big Milky Way and especially in winter the sky just pops, you get out there at like midnight, one in the morning, and it's just amazing, and then what I would do is I would look around, and look for stuff just off... sort of that I couldn't quite see that there was something there, you would see it out of the corner of your eye, and then you look over and maybe you wouldn't see something, then you look away again and you'd see this fuzzy bit.

Pamela: Yeah and sometimes it's not even required to use off-access viewing, yeah, it's...I keep rediscovering the fuzzy blob in the center of Cancer – that's my special ability.

Fraser: Which one is that?

Pamela: See, this is the problem when I constantly rediscover it. I believe that one's the Beehive.

Fraser: Right, right, right, and so what you do is you look at these blurry things, and then I would pull out my star chart I had a nice, beautiful...I have Night Watch, by the way, if you want my #1 recommendation for a book that lists all of the objects in the night sky, I love Night Watch. So I had that book, and I would look at it and find the object: "Oh, that's the great galaxy, Andromeda! Oh, that's the great nebula in Orion!" And so as you said, for a lot of these things you're rediscovering them, and these are the Messier objects, and if you ever have seen a comet with your own eyes, you know, that's something completely different, and you need to keep them straight. So let's learn about Charles Messier. So who was Charles Messier?

Pamela: Charles Messier was a French astronomer who worked in the late 1700s early 1800s, and he's like many of us -- someone who as a kid just had this moment of "Oh, my God! Astronomy is so awesome – that's what I want to spend my life doing!" And for him that moment of complete "awesome" was the great comet of 1744. He was 13 years old when it went overhead, and this was an object that ranks as one of the top 10 brightest recorded comets. It, at one point, was reported to have 6 different tails, it was visible during daylight, it was just this absolutely amazing phenomena that impacted him as a teenager, so he went on to actually become an astronomer when he was an adult, and one of his first logged events that he recorded was actually a Mercury transit when he was in his early 20s.

Fraser: And so he set about trying to find comets.

Pamela: Right, so back when he was working, we were still trying to figure out this whole observational astronomy thing. There were planets – understood planets, then there were stars, and then there were fuzzy things and we had no clue what the heck all these fuzzy things were, and the real way to make a name for yourself was to discover comets because, well,

there's always the potential they're going to be bright enough and big enough that everyone can see them, then of course your name ends up in all the newspapers. It was a good way to become a famous human being, and so Messier, among many other things, set out to discover comets, and over the course of his lifetime he actually was able to discover 13 different comets at different points. One of them he shared the designation with his assistant, Méchain. Another one actually ended up getting named after a different observer, Lexell, but it's unclear which of the two was actually the person who should get all the credit for it. But the problem with trying to be someone discovering comets, and this was a problem that William Herschel and his sister Carolyn also dealt with, is comets start out looking like little tiny fuzzy patches on the sky, and lots of other things look like little tiny fuzzy patches on the sky, and so the only way to tell if you've discovered a comet or not is to wait for the fuzzy patch to move or to have a catalog that lists the fuzzy patch for you.

Fraser: Right, and so you could imagine if you're just getting into this hobby that you would point your telescope in the sky, you'd scan the skies and find a fuzzy bit, and then you would go "Ha ha! Comet!" And then someone would remind you that "No, no, that's always been there ever since being have been watching the sky." Back to the drawing board, so I guess he just wanted to cut out this whole problem and build a catalog.

Pamela: Yeah. Just fix it. And so this is where, working in France, he developed his Northern Hemisphere-centric catalog of fuzzy annoying things -- to him, objects on the sky, and because he was working when he was working, all of these objects are extremely bright, and everything in the Messier Catalog can be seen by binoculars if you're at a dark site. So if you're out in western Texas, if you're in the middle of the prairie of the United States and it's clear, if you're in one of the random, rare, empty patches that's fairly dark in Europe, anywhere in Siberia, for the most part, unless you're in Lake Krasnoyarsk -- there's not much there. So as long as you're in the north, and you're somewhere fairly dark, all of these objects are available for you to look at.

Fraser: It's interesting, though, you said Northern Hemisphere. He was operating out of France, and so there's going to be huge portions of the sky that he had no way to see, and even though there's some phenomenal parts of the sky, they're just not on the Messier Catalog because he wouldn't notice them, so they just get less publicity unfortunately.

Pamela: Well, and you know, and Sir Patrick Moore actually worked to fix this. So there's a catalog called the Caldwell Catalog, that Patrick used his mother's last name, Caldwell, when he published this catalog. I guess the "Moore Catalog" would just sound kind of funny, but the Caldwell Catalog is Sir Patrick Moore working in the 1990s to try and fix this problem. So he looked at the fact that there's 109 Messier objects, found a matching list of 109 southern hemisphere viewable objects and created the Caldwell Catalog that brings in all the cool things from the Southern Hemisphere, so he has for instance, the Jewell Box Nebula, 47 Tucanae, which is a globular cluster, Omega Centauri, Centaurus A -- all of these different objects are tied into his catalog, allowing people to basically go back and forth between the two hemispheres and have equally biased catalogs on either side of the Equator.

Fraser: Yeah, so you know, the people in the Southern Hemisphere -- there's some love there. But that's how it goes, right, it's just like whoever gets it out there first, the name sticks and that's why we have Messier marathons, which we can talk about at some point later on. Right, OK, so he went through this process, he gathered together this list of all these objects so that he could discover comets, and in the end, you know, discovered like you said, quite a few on his own and then...

Pamela: But those aren't his lasting legacy. His lasting legacy is this catalog of things that annoyed him.

Fraser: Yeah, not the comets, but in fact, the not-comets, which he didn't discover, he just...

Pamela: Catalogued.

Fraser: Catalogued, which...

Well, in a few cases, he was the one who discovered them. That's the thing -- at the time when he was working, yeah, it's not to say he was necessarily the first person to view all these objects, but in some cases he and his assistant, Mechain were the first ones to write down these objects, which actually has led to evolving credit on this list (for lack of a better way to put it). When the catalog was first published, there were only 45 objects in it, and then they came out with the second version that brought it up to 103 objects, one of which didn't exist, which always makes for interesting times,

but if you look at it today it's 110 minus 1 objects, and those additional objects come from folks going through his notes and realizing "Wait, they discovered other things that they deserve credit for." So Nicholas Flammerion in 1921 added Messier 104 after finding a note in the margins of one of their catalogs, and 105-107 were added by Helen Sawyer Hogg in 1947. Owen Gingerich was still adding objects in 1960, so this has been an evolving process as people go through the original documentation, and this is where our archivists can play such an important role in making sure people get the right credit for the discoveries, so it became 110 objects based on realizing "Hey! Wait! They're the ones that discovered this. Let's make sure they get credit in their catalog for their discoveries."

Fraser: So in fact the Messier Catalog...so what you're saying then is the Messier Catalog lived long after Messier's life himself and other people were able to contribute to it, and I mean, but is it locked and closed down now? Is there any way that people will ever be adding things apart from, say, historical discoveries?

Pamela: Well, there's always the possibility that someone will be going through letters, someone will be going through notebooks and realize "Oh, wait! Here's this other thing that was discovered that we just don't have a record of." So you can never say never to something like that, but at this point I think, especially after Owen Gingerich, who is an amazing astronomer and an amazing historian -- after he went through the all records, I think we can close the door on new things being added, but you never know when another letter is going to be discovered.

Fraser: Or some other object could appear. I mean, some of the objects are supernova remnants, and so you can imagine in the far future we'll end up with a new supernova remnant.

Pamela: Right, but I don't think they'll give credit to Messier for something new.

Fraser: No that's true, that's true, but I wonder, you know?

Pamela: So that's a new catalog at that point.

Fraser: Right, OK, so what kinds of objects would we find in the Messier Catalog?

Pamela: Well, it's anything, by definition, that could, through a low-power telescope or a pair of binoculars, could cause an observer to go, "Is that a comet?" So all these types of things are either stars that are so close together that their light kind of combines into a cloud, or things that are actually cloudy. So we have open clusters like the Pleiades, globular clusters like M13 in Hercules, which is this tight little cotton ball of stars on the sky, there's planetary nebula, there's supernovae remnants, there's random nebula... So like the North American nebula is this big, beautiful, red object on the sky, gas that has starlight passing through it, and the blues get filtered out so that we see the beautiful reds, and then there's galaxies and Messier didn't even know what galaxies were, but he, along with Hershel, is responsible for finding some of the most beautiful ones in the sky.

Fraser: I mean even up until 100 years ago they called them nebula.

Pamela: Yeah.

Fraser: "The Great Nebula in Andromeda," right?

Pamela: Less than 100 years ago we were still arguing, not *we*, but, I mean, what's amazing is you talk to Owen Gingerich, who's one of the oldest professional astronomers, who's also done all the history work, and you ask, "What's the most amazing discovery in your lifetime?" And they say, "Galaxies!" [laughing]

Fraser: [laughing] Galaxies! That's pretty amazing!

Pamela: [laughing] It's like – OK, totally new perspective on everything...so yeah, these are all objects that look cloudy until you start to really resolve them with larger and larger telescopes.

Fraser: So then, you know, both you and I have done some visual observing, and so, you know, what are your favorite of the Messier objects?

Pamela: I have to admit M51, the Whirlpool Galaxy. It's what everyone absolutely adores, and I'm just a follower on this one. It's one of my favorite objects. I used the McDonald observatory 30-inch telescope, which has a giant field of view, to image this anytime that I couldn't use the telescope for my science, so while waiting for the Moon to set, I'd be out

there happily observing my galaxy, trying to get a beautiful, pretty picture of it.

Fraser: I'm going to say that my favorite is the Ring Nebula.

Pamela: The Ring Nebula...that one's a challenge because it's not that large on the sky.

Fraser: Well, it's not that large, but it is...it's M57, right...it's not that large, but it actually...I was able to find it in my...I had a little 4-inch telescope growing up, and that was one of the first objects I was able to find, and I think what was great about the Ring Nebula is it really looks like a little ring, but a lot of the other things, as you say, the Whirlpool Galaxy, yeah, if you've got a 30-inch telescope, then you can see, and you've got a nice, long exposure then you can see the beautiful spiral nature, but if you're just doing visual observing, looking through your eyepiece, there's not a lot of these objects that look like what they're supposed to look like in the picture, but the Ring Nebula, for me, always really looked like a little ring floating in space...and then I would say the great globular cluster in Hercules.

Pamela: Yeah, that one is...it's harder to find than you'd think. I don't know how many nights I spent basically lying on my back, binoculars in one hand, planisphere in the other, trying...you can't look through both at once, or look at *and* through both at once, desperately trying to star-hop my way there before I found it.

Fraser: Yeah, you've got to go up and down between these two stars on the side of Hercules trying to find it. And then, of course I would say, the great nebula in Orion, which is just absolute beautiful, clearly fuzzy bit in the sky, which is even starting to show some color, which is fairly rare for a lot of these kinds of things.

Pamela: And what's kind of amazing is the sheer diversity in objects that he found. So you have everything from extremely disturbed galaxies to these beautiful, classic galaxies; you have little, tiny objects like the Owl Nebula, which is another one of my favorites. It's a little planetary nebula that just happens to have two darker patches that look like owl eyeballs.

Fraser: Absolutely looks like owl eyes! Absolutely, yeah...

Pamela: And it's just this amazingly rich way to get people engaged in astronomy by saying, "Look at the diversity and the beautiful things that we have in our field!" And the name is kind of fun to play with. As a little kid, and as someone who as someone who has absolutely no knowledge of the French language, other than what you learn from Miss Piggy on the Muppets, which isn't useful in France, I learned it...Messier -- you don't see it as Mess-ee-ay, you see it as Mess-ee-er, like your "messier" bedroom, and as a little kid, I read it that way. I thought this was the catalog of "messy" objects on the sky, and that's actually a really neat way to engage people. Look at what the Universe has to offer -- not everything is perfect and symmetric and beautiful the way you'd expect the planets to be. Sometimes you have things that look like squished bugs, and then when you start to understand them, you realize they look like that because this is two galaxies that collided into one another, and they literally splattered across the Universe, and this is where Messier marathons becomes so interesting.

Fraser: Yeah, well, I was going to talk about the Messier marathon next as well. So what is a Messier marathon?

Pamela: Well, it's basically just like the name "marathon" implies, it's kind of an endurance mission to try to make it through all the objects, and you have to start at the moment the Sun gets far enough below the horizon that you can start to pick these objects up. You need to be in the Northern Hemisphere, and ideally somewhere between about 20 and 30 degrees north, so like Texas, Florida, Mediterranean area...these are all fairly good, northern Africa is fairly ideal, and from these latitudes just as the Sun sets in mid-March, you're able to start picking up the westernmost objects for that time of year at sunset, and then if you quickly flip through them through the night you can basically hop from Messier object to Messier object and just before the sun comes up, if you're good, and you're efficient, and you find things quickly, you're able to make it through the entirety of the list. Now the problem is you hit certain areas, like the Virgo cluster of galaxies, or the center of the Milky Way and there's kind of stuff everywhere, and so there's a whole lot of "Did I find the right thing? Did I find the wrong thing? Did I...?" And so you have to try and leave time for those objects. You're not actually allowed to linger on anything.

Fraser: No. There's a certain time of year that you have to do it, right?



Pamela: March.

Fraser: You have to do it in March. March -- like a very specific time...

Pamela: Right. And the reason for this is the combination of, well, in March, no matter where you are on the planet, you have basically 12-hour-long days, and so with those basically 12-hour-long days, you have just enough time to get through everything, and the other is there is somewhat of a biased east-west in when you can see objects, and it just happens to work out that in March is when you're best able to get everything up all at once between sunset and sunrise.

Fraser: Well, What kind of a telescope would you need, you know, to definitely complete a Messier marathon, you know, what would be the bare minimum gear that you would need?

Pamela: Well, if you want to say you're definitely going to complete it and you don't care about cheating, I'd say anything with a go-to drive.

Fraser: Well, of course! Yeah! [laughing] Right. You don't even have to look through the eyepiece! You just make sure it's polar-aligned, and just press the button and watch your telescope from afar, and you know, update it 100 and whatever -- 9 times, 8 times and you're done.

Pamela: Yeah, so personally, I consider that cheating, so if you want to be a purist, then I'd say you need a good star atlas (paper works!), a red flashlight, and a pair of fairly perfectly reasonable binoculars -- so something with a nice 7-degree field of view probably will do it for you. You don't need anything fancy, I mean, the thing to think about is this was discovered by a guy working through a refracting telescope made by hand a couple hundred years ago. Our everyday spotting scopes are way better than anything he could have imagined. Now, a nice easy way to do this, if you want to use a telescope, is just get yourself a nice 6-inch or 10-inch Dobsonian, and move your light bucket around the sky gathering light, and what's neat is so many people have spent so much time in trying to figure out how to do this well, and how to do this right that there's actually, if you search around you can find, "OK so do this object, this object, hop from here to here..." instructions on how to do this efficiently.

Fraser: Yeah, you don't want to do them in order. You don't start at one and go to two, you know, you have to start in whatever object is closest to the horizon, although they...

Pamela: Closest to setting...

Fraser: Yeah, but in some cases, you know, the numbers are kind of similar because as he was creating these numbers, he would, like what is it, M81 and M82 are two galaxies, are side by side, and they're probably actually interacting in Ursa Major, so you know, there's some that are connected in that way, but in many cases, yeah, you've really got to... the only way to possibly do this is to follow someone's list or checklist, and then do a few practice runs, and try to make sure, you know, different times of the year, and make sure you can find these constellations and find them fairly rapidly, and then, when the time is ready, get your gear and do it.

Pamela: One of the confusing things about the Messier Catalog is it's not ordered by type of object, so you don't find all the planetary nebulae clustered together in numbers, it's not ordered numerically from east to west, it's pretty much in the order that they found things, and so while there are pockets of numbers that go together -- the Virgo cluster stands out rather nicely, the rest of it is just kind of random, so you just need to get yourself a map, and it's just like taking any tourist trip, you have to figure out what roads you're going to take to get from one stop to the next.

Fraser: So and this is one of the things that we're planning. I don't know if people have been watching, but we've been doing these live star parties on Google plus. We've been connecting together four or five telescopes all at the same time and streaming into a Google plus hang-out, and so our "maybe" plan in March is to do a Messier marathon, and do it in like a couple of hours to just have astronomers around the world all streaming together their go-to telescopes, and just knock it off get a world record for a Messier marathon.

Pamela: And the thing is we can seriously cheat because we can get observers that are spanning 6 hours apart across the planet, and always get them at zenith.

Fraser: Absolutely! Yeah.

Pamela: So we just wait for the objects to be in the ideal spot in the sky, and then we check them off of our list.

Fraser: Yeah. Exactly.

Pamela: Now, that's totally cheating. We will not earn any certificates for completing a Messier marathon doing this.

Fraser: [laughing] Are there certificates that you get? Are there?

Pamela: There are actually.

Fraser: Really? OK.

Pamela: So the Astronomical League has put together certificates for *how* you observed and *how many* you observed in a given night. I tried really hard to get my Messier certification with binoculars, only I failed. I got lost in Sagittarius, and couldn't differentiate from one object to the next before I got called off to go do something else.

Fraser: That's cool. I would like to do that some year. So then like if people really want to just do it, pair of binoculars, sky chart... What would you say if you want to start discovering your Messier objects, and you don't have to do it in one night because different parts of the sky will be visible at different times of the year, and you'll have the optimum times to do it and you can just pick away at it segment by segment? There is a...on *Universe Today*, Tammy Plotner used to do a "Messier Week." And so she would recommend you take a course of a week to chip away at a Messier marathon, just, you know, don't try to kill yourself in one night. But then, gear -- I just want to talk about that last thing, people want to start doing this and really starting seeing the Messier objects and identify them, you said sort of what? Like 7 x 35 binoculars, maybe a little better than that, right?

Pamela: I think 10x40s is what I'd go for. The larger the front aperture you can get, the better -- 50, 60 -- just increase that number until they get too heavy to hold. So bare minimum equipment is a good atlas, they make them online, which saves time and energy, just make sure that whatever you're using has a red mode so you don't blow your dark adaption, nice pair of binoculars, and then I use...we have one of those hammocks on a stand in our backyard, and so I'm up off the ground and comfortable nested in my

hammock unless the dog decides to join me in which case we swing a little bit violently.

Fraser: Yeah, binoculars pointed skyward...

Pamela: Yeah, lawn chair...something like that, something that allows you to lie down and be comfortable without the creepy crawlies crawling on top of you, and the thing about the Messier objects is because they are distributed fairly consistently across the sky (there is a gap), you can go out a couple hours after sunset every night, take in a few, and just let the sky pass overhead, and over the course of the year, you can get to see everything when it's highest in the sky and easiest to view.

Fraser: So break it up. Don't get in such a rush.

Pamela: And all you Southern Hemisphere people – Caldwell Catalog.

Fraser: Caldwell Catalog, yeah, Caldwell Marathon -- Caldwell/Messier marathon...

Pamela: Exactly.

Fraser: Yeah. Alright, well, thanks a lot, Pamela.

Pamela: It's my pleasure, Fraser.