Corona Borealis: Cosmic Background

(Transcribed by Sonix.ai)

[00:00:15] **Jordan:** Hi, I'm Jordan.

[00:00:17] **Kit:** And I'm Kit.

[00:00:18] **Jordan:** Welcome to Starry Time. Where stars plus lines.

[00:00:22] **Kit:** Equals stories.

[00:00:23] **Jordan:** For our final series of episodes this season, we'll be exploring the constellation Corona Borealis, the northern Crown.

[00:00:33] **Kit:** This week's episode will be focused on the astronomy and other cosmic background of this constellation.

[00:00:39] **Jordan:** Corona borealis is a relatively small constellation. It ranks 73rd in size among the IAU recognized 88 modern constellations, and it is only slightly larger than the even smaller constellation that we started our second season.

[00:00:58] **Kit:** Quests and Curses!

[00:01:00] **Jordan:** which was, of course, the southern crown, Corona Australis, which ranks 80th out of the 88.

[00:01:07] **Kit:** And these are the smallest constellations that we've covered by a lot. And it is also one of Ptolemy's great.

[00:01:15] **Jordan:** Great great great great great great great great great great great great great great great.

[00:01:20] **Kit:** 48 constellations which he identified in his second century text, the Almagest.

[00:01:27] **Jordan:** All right, Kit, let's start with your first impressions of this little constellation. What did it look like to you?

[00:01:34] **Kit:** It's a "U". I mean, I'm I'm back to letters because it's a "U".

[00:01:40] **Jordan:** I mean, I don't blame you for that one. It's a "U." You're right. It's a "U".

[00:01:47] **Kit:** Yeah. I just can't really get to Northern Crown. Can you get there? I don't I don't know

[00:01:53] **Jordan:** I mean to me the semicircle aspect of it definitely reminds me of something jewelry like, like, but to me it looks like a necklace or a tiara. It doesn't look like a crown to me, but Yeah. So, like, if you wrote a "U" in a very classy font.

[00:02:14] **Kit:** These descriptions are probably not helpful. So you can find this constellation -- it's visible between positive 90 and -50 latitudes, and it's highest in the night sky in the northern Hemisphere in July.

[00:02:28] **Jordan:** Coming right up. It is between Hercules, who we covered earlier this season, and the constellation Boötes. If you're not sure where to find these specific constellations, you can look for the bright stars of Arcturus, which is in Boötes, and Vega, which is in Lyra.

[00:02:46] **Kit:** Which we also have covered this season.

[00:02:48] **Jordan:** It's been a great season, Quests and curses. But if you draw a line between those two stars in between them you will find Corona Borealis.

[00:03:00] **Kit:** Getting a bit more technical, which we love to do here. It has a right ascension of about 16 hours and a declination of 30 degrees.

[00:03:10] **Jordan:** We love getting technical here. All right, now we know where to find it and what it looks like. Let's talk about some of the stars here. This constellation is

comprised of seven main stars. And Kit, I am hoping beyond hope that our favorite historical lawyer slash astronomer slash icon, Johann Bayer, goes out with a real crown of his own this season. Could you please make this vision come true for me? What is the brightest star of this constellation?

[00:03:45] **Kit:** Corona borealis doesn't actually have very many bright stars. And the stars that comprise the crown itself are all fourth magnitude except the brightest one, which clocks in with an apparent magnitude of 2.24 and is designated as Alpha Coronae Borealis.

[00:04:05] **Jordan:** Great job. I mean, it doesn't hurt that it's significantly brighter than every other star, but hey, Johann, a win is a win and we love to see it go out on top. Before you go on, though, Kit, I did a little number crunching before this final cosmic background of season two. So this season we covered 11 constellations and Johann identified the brightest star in. Well, do you want to take a guess what percent of the time.

[00:04:37] **Kit:** Johann got it right?

[00:04:38] **Jordan:** That Johann got it right, yes.

[00:04:41] **Kit:** Okay. So I feel like this season he did better than 50 over 50. Like, I feel like this season was better than the first season. Maybe. Like, maybe, you know, not to just go down the middle. I'll say like 60% correct.

[00:04:57] **Jordan:** Well, Kit, our guy Johann. Went an astoundingly okay, nine for 11, 82% correct.

[00:05:09] **Kit:** Well, that's a that's a B minus. So that kind of that kind of feels right.

[00:05:14] **Jordan:** Hey, if you can get in the history books the solid B-minus effort, Johann, carry on.

[00:05:20] **Kit:** So it's officially named Alphecca, which is from an Arabic phrase meaning the bright star of the broken ring.

[00:05:29] **Jordan:** Ooh. The broken ring does sound like a book series that we need to read. I'm ready for it.

[00:05:36] **Kit:** Yeah, it has very epic fantasy vibes. So Alpha Coronae Borealis is actually an eclipsing binary star system, and it's located in the center of the U shape of the constellation. It's 75 light years from Earth, and it's comprised of two main sequence stars.

[00:05:54] **Jordan:** And we did learn about eclipsing binary stars in our cosmic background of Perseus. Didn't beta Persei, aka the Demon Star, include an eclipsing binary?

[00:06:07] **Kit:** Yeah, absolutely. It did. And it's the same idea here. These two stars orbit in a period of about 17 days, and the change in the magnitude is relatively small, about 0.10.

[00:06:19] **Jordan:** Yeah. I imagine you're going to need a telescope to see that kind of change.

[00:06:23] **Kit:** Oh, yeah. Unless you've got superhuman sight.

[00:06:26] **Jordan:** Well, considering how well we did with Percy Jackson and the Olympians, I'm not. I'm not liking our chances.

[00:06:33] **Kit:** No. There is some evidence that this system has a planetary or proto planetary system, because there seems to be a dust cloud of some kind around the system, but we don't have any confirmed planets yet. And the final tidbit that I learned about this star is that it is one of the 15 Behenian fixed stars, which were stars that were considered special and magical and medieval astronomy.

[00:07:00] **Jordan:** Some of the other ones that we've met this season that are also part of this magical group include Algol, the Demon Star, once again, Beta Persei, and Vega, also known as Alpha Lyrae. There are also some other stars from previous

constellations represented in this group, including stars from some of our earlier constellations that we covered: taurus. Leo, Virgo and Capricornus.

[00:07:28] **Kit:** Wow. Shout out to season one constellations. So now that we know that bear is a B-minus student, let's move into our next segment, Bayer's Variable Star, where we follow the Greek alphabet. Well, one of us does, and we learn about the Bayer designated stars in the night sky.

[00:07:49] **Jordan:** I'd like to think I follow about 82% of the time.

[00:07:53] **Kit:** Well, we're supposed to be on Omicron Coronae Borealis, but this was up to you, Jordan. What what did we decide to do.

[00:08:02] **Jordan:** Here on the last cosmic background, I wanted to ensure the integrity of Variable Star in its current iteration.

[00:08:11] **Kit:** Very important.

[00:08:13] **Jordan:** Kit, i didn't want to let you down. And plus, it doesn't hurt that Omicron Coronae Borealis actually does have some interesting stuff going on. Unlike the last time I had to deviate from Nu Lyra.

[00:08:27] **Kit:** Oh, poor Nu Lyra trying its best. You know, not all stars can be special. Some of them are just regular stars, like our sun.

[00:08:34] **Jordan:** Omicron Coronae Borealis is a K-type giant star. It's off that main sequence, and it's actually designated as what's called a red clump star.

[00:08:47] **Kit:** No, nope, I don't I don't care for that. I don't care for that astronomical term.

[00:08:52] **Jordan:** No. Basically these red clump stars, though, Kit. Their red giants that are a little bit hotter than other red giants. They're red giants that got redder.

[00:09:05] **Kit:** I just why couldn't we just call them hot red giants like that to me, that's better. You know, if I was in charge, if I was the Johann Bayer of our times, I'd call them hot red giants or better yet, red hot giants.

[00:09:21] **Jordan:** Kit, I prefer clump stars. You are more than free to start a petition. Omicron Coronae Borealis has an apparent magnitude of positive 5.53. Not very bright. And it's located 270 light years from Earth, so pretty far away. And it's actually moving closer to us rather than further.

[00:09:50] **Kit:** Red `clump attack.

[00:09:52] **Jordan:** The red clump star also has a confirmed exoplanet, which we love to see. This one is 0.83 Jupiter masses, so it's a little bit smaller than Jupiter and orbits every 187 or 188 days.

[00:10:10] **Kit:** Al right, so we're talking about orbit wise, sort of in the ballpark of Venus around the sun, which is about 225 days.

[00:10:17] **Jordan:** Precisely. And that's, well, that's all I got here on Omicron Coronae Borealis. But guess what? Stuck to the prompt. Let's take a quick break and then we'll come back for your Gold Star of the month pick. [music] Welcome back. This segment is called Gold Star. In this segment, we alternate picking the star or space object in our constellation of the month that captures our mind, our heart, perhaps even our soul. Let's find out. Kit, what was your pick this month?

[00:11:09] **Kit:** So Corona Borealis isn't particularly full of notable or famous deep sky objects, but there were a couple of things that stood out to me as I was learning more about this constellation. And so I have a runner up and then I've got a pick. So the runner up was a star called T Coronae Borealis.

[00:11:32] **Jordan:** T like like Mr. T.

[00:11:35] **Kit:** Yeah, just the letter T.

[00:11:37] **Jordan:** Yeah. So what's the naming convention on that one again. Because I'm not sure. Is that Greek or.

[00:11:43] **Kit:** Nope. Nope. Not Greek. So variable stars are designated with the letters R through Z, and then double R, RS, etc.. So this is a variable star which gets a different kind of designation then.

[00:11:57] **Jordan:** Yeah, yeah. This this sounds familiar. We have covered this before I, I apologize.

[00:12:03] **Kit:** I'm very upset. Okay. So T Coronae Borealis also has a nickname and it is much better than its variable star designation. Its nickname is the Blaze Star.

[00:12:17] **Jordan:** You love to hear it. What a great name. The Blaze star.

[00:12:21] **Kit:** And it has that name because it is a recurrent nova.

[00:12:26] **Jordan:** Ah, okay, so occasionally, sometimes it's blazing aka it brightens periodically.

[00:12:33] **Kit:** Exactly. So novas are not the same thing as supernovas. So supernovas are when the star basically brightens and then collapses and dies. Novas, by contrast, are actually a periodic brightening. They're caused by a variety of different things. But in this case, the Blaze star is being caused by the interactions in this binary system. So this binary system is comprised of a white dwarf and a cool red giant. And the cool red giant is transferring its stellar materials to the white dwarf. And the white dwarf, as a result, has an accretion disk around it. And periodically just big chunks of material are transferred in the luminosity of that white dwarf brightens, and then it kind of simmers back down. But the star is still intact. It hasn't exploded and collapsed. It's just periodically brightening because of this interaction.

[00:13:30] **Jordan:** If I was to explain it like I was five, I would say White Dwarf gets a big meal and is happy.

[00:13:36] **Kit:** Right. Yeah. Pretty much.

[00:13:37] **Jordan:** Sounds great to me.

[00:13:40] **Kit:** So we have a record of this particular recurrent nova since as early as 1886, when it was observed by John Birmingham. John Birmingham lived between 1816 and 1884, and he was an Irish astronomer and also a polymath, poet and amateur geologist, and he was also fluent in several languages.

[00:14:05] **Jordan:** Dang doing it all John Birmingham.

[00:14:09] **Kit:** We also have some historical records suggesting that this nova was also observed in 1217 and in 1787, but those ones aren't necessarily confirmed as the blaze star. That said, we do have confirmation of this star blazing in 1938, 1946 and 2015 and there was a recent release back in June of this year of 2024 from NASA, saying that they're expecting the blaze star to brighten sometime very soon. It dimmed noticeably in March 2023. And so they're saying like, keep a lookout because this is coming probably this year, but certainly within the next two years.

[00:14:53] **Jordan:** Okay. If I was lucky enough to plan this right, what kind of apparent magnitude swing would I be on the lookout for? Like, what are we talking about in terms of this nova, Kit?

[00:15:03] **Kit:** So it seems to vary quite a bit. Usually this star, which is actually two stars, has an apparent magnitude of 10.5. So positive 10.5, but it's increased to 9.2, which is not very much. But we've also seen an increase to positive 2.5. So when it does blaze we might be able to see it or it might be one of these smaller blazes. It kind of depends on how much it's eaten from that red giant.

[00:15:33] **Jordan:** That makes sense. It's dependent on the amount of material being transferred, i.e. eaten between the stars. So it's not going to be predictable or necessarily as large as other kinds of novae. And we'll find out.

[00:15:46] **Kit:** Yeah, it's kind of exciting. It happens about every 80 years or so they estimate with the blaze star. So it's kind of cool that we'll get to see it. So obviously the

blaze star has an amazing name and is cool. But my gold star actually this month goes to Abell 2141, which is an ongoing merger of two galaxy clusters.

[00:16:10] **Jordan:** I can't even wrap my head around this. Tell me more.

[00:16:12] **Kit:** Yeah, so we're talking clusters of galaxies. So the Milky Way is an example of a galaxy, right? But we're in a group of galaxies. So these are groups of galaxies held together by gravity. And these two clusters of galaxies are merging. So we're talking about hundreds of galaxies. Lots and lots and lots of gas and an object, when we're thinking about these two clusters together, that's about 6 million light years across.

[00:16:41] **Jordan:** So we know the entire Milky Way galaxy is approximately 100,000 light years--a mid-sized galaxy. So to go from 100,000 to 6 million, I mean, this is like hard to imagine.

[00:16:58] **Kit:** It's huge and it's massive. And we actually know quite a lot about this collision from the Chandra X-ray Observatory, which has showed actually different pressure fronts and temperature readings, which actually sort of means that this collision has a weather system, not like we know it, but sort of that same idea of like...

[00:17:19] **Jordan:** It's a complex, chaotic system that's playing out. But yeah, how far away is this going to be? Like, what kind of things do I have to worry about?

[00:17:28] **Kit:** All right, well it's moving away from us. So that's the first good news.

[00:17:32] **Jordan:** Great.

[00:17:33] **Kit:** And the second good news is that it's 1.2 billion light years away. So nothing to worry about. A lot to learn, lots of science to do and think about. And there's actually a really cool tour of this merger from the Chandra X-ray Observatory, and I'll definitely post that on the socials, because it is very cool, and it's even cooler knowing that it's very far away from us.

[00:17:55] **Jordan:** What an excellent addition to the Gold Star of the month club. Abell 2141. Best of luck to both galaxy clusters in your future union. [music] This brings us to the end of our exploration of the cosmic background of the constellation Corona Borealis. Next week we will be retelling and retconstellationing the myths of this constellation.

[00:18:29] **Kit:** This has been Kit.

[00:18:31] **Jordan:** And Jordan.

[00:18:32] **Kit:** Sisters, lovers of stars and stories.

[00:18:34] **Jordan:** And we'll see you next time.

[00:18:36] **Kit:** On Starry Time.