Constellations Across Cultures

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There are hundreds of billions of stars in our galaxy, though only about 5,000 are visible to the naked eye. Under ideal conditions and far from city lights, you can see about half of them on any given night. Cultures the world over see similar shapes in the night sky–the Big Dipper, Orion, and the Pleiades are just a few. New research, as discussed by Charles Kemp and published in the journal *Psychological Science*, reveals that our visual processing system may explain the striking commonality of constellations across cultures. Read the news release here.

Image Credit: Derek Demeter

Transcript

Charles Blue (00:12)

The Big Dipper, Orion and the Pleiades are just a few of the many recognizable star patterns in the night sky. New research published in the Journal Psychological Science reveals that our visual processing system may explain the striking commonality of constellations among cultures. I'm Charles Blue with the Association for Psychological Science, and today I'm talking with Charles Kemp with University of

Melbourne and lead author on that paper. Welcome to under the Cortex.

Charles Kemp (00:40)

Thank you. It's a pleasure to be here.

Charles Blue (00:43)

I am actually an amateur astronomer, so I've spent a lot of time looking at the night sky. Even so, with my wildest imagination, I don't see a winged horse when I know I'm looking at Pegasus or a mighty hero in the constellation of Hercules. I'd always assumed there was a lot of cultural influence for people to imagine such shapes. Your research takes a direct look at the connection between culture and patterns in the sky. Can you give us a little overview of what you've discovered?

Charles Kemp (01:14)

Sure. Well, first of all, I would agree with you completely that there's a huge cultural influence on the patterns we see in the night sky. And that was one of the questions we wanted to ask with this research to understand what's the balance between the influence of culture and the influence of visual perception. So three of our team of psychologists and I think that many psychologists would first think about addressing a question like this by developing a new clever lab task. But we did something different. We looked at the constellation systems from cultures all around the world, thinking of these as the outcome of the natural experiments in which people over many years in different places around the world have looked at the same stimulus the night sky and organized it differently into groups. And I think we really did two things in the research. The first thing was just to look across 27 different cultures. What commonalities do we see in the groupings of stars in the constellation systems? And we found that certain constellations are near universal, so things like the Pleiades, the Big Dipper, and so on. And this was expected from previous research.

Charles Kemp (02:16)

But we also found there was a long tail of constellations that might not be universal, but appear across many unrelated cultures. So these included things like Corona Borealis, Corona Australis, Delfinus and others as well. So that was just documenting the convergence in constellations across cultures. In the second part of the research, we asked, why might we see these convergences? And we looked at that using a computational model that groups stars into structures based on brightness and proximity. So the model says stars in the nearby are likely to get grouped together, and the model is particularly likely to pay attention to bright stars rather than faint stars. And we found that a model like that did a pretty good job at explaining the kinds of groupings that are recognized by multiple cultures around the world.

Charles Blue (03:06)

So previous research, or at least previous thinking, was that regardless of the orientation or the presentation of the stars, there had to have been some sort of cultural reason for seeing these patterns, that there were stories, there were traditions, and, for example, as we discussed Pegasus and Hercules, how much does your research complement or differentiate from that?

Charles Kemp (03:31)

Well, I think our research is consistent with that, but perhaps suggests a slightly different idea about where culture comes into the process. One way you can think about this is using ideas from the literature and visual perception. So vision scientists sometimes talk about lower level vision, mid level vision, high level vision. So in our context, low level vision would be noticing individual stars. Mid level vision would be grouping individual stars together, and high level vision would be attaching some kind of interpretation to the groups that you see. So from this perspective, figuring out that seven particular stars go together into something that we call the Big Dipper grouping, those seven stars, that would be mid level vision, but seeing them as a Dipper rather than a vehicle or a leopard or something else, that would be high level vision. So I think our approach suggests that basic processes of visual perception are offering up the same groupings to people all around the world. But then our culture comes in when influencing the stories and the interpretations people give to those groupings of stars.

Charles Blue (04:34)

Well, humans are pattern seeking animals, so this is a connection to our ability to find patterns, or is it something more basic?

Charles Kemp (04:45)

Well, I'm inclined to think that the entire process of vision might be a process of finding patterns from the lowest levels up, and this is consistent with some ideas in the literature and visual perception. If there's an object out there in the world, then light bouncing off that object is going to have predictable properties. So I suppose I think of this idea of patent finding is fundamental to all stages of vision. And I suppose I think about what we're doing is looking at patent finding at the level of mid level vision, how individual stars are grouped together to form larger units.

Charles Blue (05:22)

I'm really curious about the breadth of your research. You surveyed a whole variety of cultures and civilization. How broad was this? Was this a survey across both geographic and temporal civilizations? How much of Earth's culture were you able to really dive into?

Charles Kemp (05:43)

We were able to look at data from 27 different cultures, and these were cultures from all around the world. So Europe, Asia, Australia, North America, South America. And we were able to do this largely in part because of Stellarium, which is an online Planetarium. It's a piece of software you can download and try out if you're interested. And it's really great. One of the things it does, it's provided kind of a gathering place for people all around the world to document their local sky cultures, and we use some of those data. So this was really a game changer for us. In the early stages of this research, I had laboriously documented constellation systems for three or four different cultures. Just going from the scholarly literature and it took a huge amount of time.

Charles Blue (06:27)

There's a lot of stars out there, so I'm sure there are a lot of constellations to contend with.

Charles Kemp (06:31)

Yes, the Chinese system that was one of the ones I documented. The version I documented had about 300 constellations, I think. So there I was not taking all of these things, and it was just a relief to find that a lot of this work could be done already by contributors to Solarium.

Charles Blue (06:47)

Was there anything in your research that surprised you was unexpected?

Charles Kemp (06:53)

Yes, there was. So one message of our paper is that perceptual principles explain more of a shared structure of consolation systems across cultures and previously recognized. But I still want to emphasize that there's a huge amount of variability. And in fact, the amount of variability across cultures was something that surprised me. So things that I just taken for granted just don't apply universally when you look across cultures. So one example is you might think that constellations tend to come in a certain size, may be related to the amount of the night sky that a person can take in a single glance. But there are some cultures, like the Guitar in Alaska, that have whole sky constellations. And the Big Dipper is the tail of a creature. The creature is called Guardian, I believe, and the Big Dipper is just the tail of the creature. So that gives you a sense of the scope. So that kind of thing was striking and intriguing and a surprise.

Charles Blue (07:48)

I've had the fortune to be able to spend a fair amount of time in the deserts in Chile, which are phenomenally dark. And it's really, first of all, striking how many stars you can see on any given night, 2500 stars is not uncommon, and they are incredibly bright. On a moonless night, I could actually see my shadow just from the Milky Way. But what I think is also striking is when you see allegedly familiar constellations in a different hemisphere, suddenly Orion is now standing on his head. When I'm used to seeing him headside up and the Big Dipper is twisted about and you can't see them as you normally would. Did you find that there was actually a difference? When you're considering Northern and Southern interpretation of constellations, do the same groupings apply?

Charles Kemp (08:41)

That's an interesting question. This work, I suppose, is really a starting point. We didn't look so much at the actual interpretations of the groupings, but that's a really fascinating area for future work. This question about Northern versus Southern cultures, there's kind of a very basic first level thing that we see in the data, which is cultures from the Southern part of the world are more likely to identify Southern constellations. So things like the Southern Pointers and the Southern Cross and so on, which is kind of obvious because in certain parts of the north, you can't even see those constellations. And in places where you see them rarely, only for a few weeks or so. In a year, then you're less likely to have names for them. So that's something that we have looked at.

Charles Blue (09:26)

But your findings provide any new insights into the way humans see patterns. And I'm thinking of something like Pareidolia, where this is the tendency to see patterns and faces and random objects like an overly burnt toast or religious iconography and a piece of wood. Is there any connection with this? And does it provide any sort of deeper insights into the way humans see patterns?

Charles Kemp (09:51)

So I think there is a connection. And in fact, one member of our team, Simon Cropper, has worked on pareidolia before. I would say perhaps that the questions we were asking open up a new paradigm for studying paradigm, a new experimental paradigm, perhaps, where you present people with dot stimuli and you ask them to both organize them into groups and to tell them what you see. And in fact, my coauthor, Simon Crowd, has begun to develop experiments like this. And so one of the interesting things here is that constellations, in a way, the visual stimulus is relatively impoverished. It's just a bunch of dots. Right. But people put them together and see objects. So you could imagine a line of work where you vary things like the spacing between the dots and the regularity and so on, and you study well, does that affect the probability that people will be able to interpret the dot stimulus as something meaningful to them? So Silent Proper has just been, I think, starting out along this line of research, actually doing an experiment where you show people patterns of stars and ask them to interpret them. But I think there's a really big, unexplored space of questions here to look at.

Charles Blue (11:06)

I have one final question, and I'm not sure if you've noticed, but in the Northern hemisphere, there is, of course, the old thing about the man in the moon. You take a look at it, you can almost see a face and first faces pop out. Now, I guess in Australia it has a different orientation the way you see it. Is there any obvious facial pattern that is recognized or thought about by looking at it? What I would consider upside down.

Charles Kemp (11:32)

So I don't know. My colleague Dwayne would know. He's an expert, expert on Australian astronomer. I can say that Chinese see a rabbit in the moon, I think, and it's associated with a story about a mortal who went up and lived on the moon. So that's at least a second data point suggesting that there are different stories about the appearance of the moon sounds delightful well.

Charles Blue (11:56)

I definitely am looking forward for the summer constellations to come out here. I always enjoy Hawaiian when he arrives in the wintertime, but I prefer warmer weather now. This is Charles Blue and I have been talking with Charles Kemp and his research is now published in the Journal Psychological Science. Thank you for joining me.

Charles Kemp (12:17)

Thank you. It was a real pleasure.