

Astronomy Cast Episode 39: Astrology and UFOs

Fraser Cain: Pamela was away at the American Astronomical Society meeting in Hawaii last week, so she's recovering but I've got a special guest, Dr. Stephen Novella, host of *The Skeptic's Guide to the Universe*. Hi Stephen.

Dr. Stephen Novella: Hi Fraser, good to be here. Thanks for having me.

Fraser: Thanks for having us over on your show – it's only fair.

Dr. Stephen Novella: It was a pleasure.

Fraser: All right. On this show, you were talking a bit about astrology and UFOs and came up with the idea that we might get your help with those topics over here on Astronomy Cast. So here you go.

So we've got a couple of topics that range outside of astronomy and really, science, so I thought we'd bring in a ringer this week to help us debunk them. So Stephen, let's get started with astrology first.

Dr. Stephen Novella: Sure.

Fraser: According to the true believers, what's astrology all about?

Dr. Stephen Novella: At its core, astrology is the notion that the objects in the heavens, the planets and the constellations – the arrangement of stars as seen from the Earth, have an influence over human affairs. They influence the personality of individuals and they also influence the events of one's life. They can bring you good luck on one day, they might make you... most people have read their horoscope where it says "today's a good day to make investments," and things like that. The notion goes back to at least several thousand years BC, this is a pre-scientific notion that our destinies are somehow tied up with things that we see happening in the heavens.

Fraser: Let's say there was some kind of underlying scientific rationale for this. What do they think is going on, the true believers?

Dr. Stephen Novella: They don't really have much to say that's cogent about that. For a long time, they didn't even really dare to propose a specific mechanism, they'd just say either that it's mysterious or say something fairly vague and vacuous such as "everything is tied together, the Universe is all tied together, it's all one" – things that don't really have any scientific meat to them.

More recently what I hear from the astrologers is an appeal to quantum mechanics, which is always a red flag when you hear someone defending a paranormal claim, or a fantastical claim by saying "well, quantum mechanics shows that things can have

action at a distance or that we're all one, we're all tied together." They don't know what they're talking about, it's really just an appeal to a poorly understood branch of science.

Quantum mechanics is the science dealing with objects at the very small end of the spectrum, atomic and subatomic particles and how they behave at that level. And yeah, at the subatomic level, a lot of really strange things happen in quantum mechanics. The problem that the astrologers in particular (and paranormal enthusiasts in general), make is taking that quantum weirdness that we observe experimentally at the atomic and subatomic level and applying that to the macroscopic world, the world of planets and people and stars. It doesn't apply; it's a complete misreading and abuse of quantum mechanics. It's just an attempt to attach a scientific sounding term to their spiritual and paranormal beliefs.

Fraser: So, I guess in my opinion (and in yours), astrology is worthless: it doesn't actually make any kinds of predictions for what's going to happen in your life and so on. Why do people believe it?

Dr. Stephen Novella: Belief is partly cultural – the ideas have been around for thousands of years and ideas tend to have a sort of cultural inertia. Also, there are lots of mechanisms by which people fool themselves. Our brains are very powerful instruments but they are also incredibly flawed. There are multiple ways in which we can be led into believing things that are not true.

One that I think is pertinent with astrology is pattern recognition. Our brains tend to work on the basis of pattern recognition, we're actually very good at it, it's one of our cognitive strengths. We can see how things connect up and are connected. We can make associations between seemingly disparate events. However, we're too good at it, basically, so we can see patterns that are not really there. Any random noise, whether it's visual or an event or whatever can present apparent correlations, apparent patterns.

While we're very good at seeing those patterns, we're not inherently very good at deciding which ones are true, are real, and which ones are an illusion. We apparently did not evolve an intuitive sense of how to distinguish true patterns from illusionary patterns. That's what we need science for.

Science basically evolved to systematically, methodologically, distinguish between those things which only seem to be true and those things which actually are true. The problem with astrology is it just takes these patterns at face value, attaches a spiritual significance to them, a meaning to them, and the science really isn't there to support the notion that these patterns are actually real.

Fraser: I guess to take the devil's advocate position for a second here, I think a lot of people don't necessarily believe astrology but they enjoy their horoscope in the paper and get some entertainment value from it. What's wrong with that?

Dr. Stephen Novella: There's nothing wrong with reading your horoscope for pure entertainment, it's like reading your fortune cookie at a Chinese restaurant – it's for entertainment, and I do that all the time. You're wrong in your premise that a lot of people don't believe it. You know 40-50% of Americans believe astrology has some validity to it, has some basis in reality. That's, you know, 40-50% too many.

Fraser: So have there been any sign of experiments that have attempted to get to the bottom of it?

Dr. Stephen Novella: A ton! There's been a lot of scientific experiments in astrology. It's one of those fields like ESP for example, it's very similar in that for decades and decades there have been attempts at proving that astrology is real by looking at either statistical data or conducting actual observational experiments, and what we see is time and again either the well designed, well controlled studies are completely flatly negative, there is simply no signal there whatsoever.

Then there are those who are previously believers in astrology (so they come to their experiment with a belief in astrology), who claim to find correlations or statistical/scientific evidence to prove astrology. When you look at it closely, in every single case it's an example of bad science; they have made some glaring statistical error in the way they have either collected or looked at the data.

The problem is that when these mistakes are pointed out to them, they don't seem to get it. They don't recant their support for astrology, they'll just go on to the next claim. They're not behaving like responsible, honest scientists. They cling to their belief in astrology, they cling to their bad methods, the bad methods that are necessary in order to create the impression of evidence for astrology because the bottom line is it's not real and there is no signal. It's just noise.

Fraser: I guess this is one of those situations where you might have a researcher or a true believer who is perfectly willing to believe a shred of evidence or maybe even an experimental mistake that proves it in their favour, but utterly refuses to believe or listen to the overwhelming evidence that goes the other way.

Dr. Stephen Novella: Yeah, and what you're saying is they cherry-pick the evidence, which is another one of those things you're not allowed to do in legitimate science. If you tried getting away with that in a mainstream scientific journal on any topic, you'd be called to the carpet on that. You can't only cite those three references that support your contingent and ignore the 20 which refute it. You'd get absolutely slammed in peer-review if you tried to do that. Astrologers though, that's their bread and butter, that's their meat, that's what they do. They cherry-pick the studies that seem to support it, ignore the ones that refute it, and dismiss or ignore the criticisms of the study they support in favour of astrology.

Let me give you one example (and this ties back with the pattern recognition I talked about): one of the things astrologers do is what's called "data-mining". Not the

legitimate corporate datamining people do to find legitimate patterns. What they might do is, for example we recently spoke on our podcast about looking at actuarial tables of driving accidents, and saying "let's look at all the Sun signs (Cancer, Leo, Libra) and see who has the most car accidents. Look at this, Virgo, they have more car accidents than all the other astrological signs".

Fraser: Well somebody's going to!

Dr. Stephen Novella: Yeah, right – somebody's going to be the worst, right?

So what they do is they look for any pattern, and then see a pattern in the noise of the data and declare that a causation. They couple that with the logical fallacy of assuming causation from correlation. They found a correlation which is just random, they then totally botched the statistics by not accounting for the fact that they're looking for any possible correlation, and then they make the logical fallacy of assuming there's an astrological causation there. Every step of the way they kind of made a mistake scientifically, they just don't see that when it's pointed out to them.

Fraser: Now as you mentioned, this stuff must just get hammered in peer-review. They must not even go through the peer-reviewed journals.

Dr. Stephen Novella: Well, it's hard for them to get published in respectable peer-reviewed scientific journals because the work is so shoddy they just don't pass muster. Then they complain they're being discriminated against, which is true in that discrimination is appropriate scientific discrimination. Just like anything, you have to pass a certain hurdle of evidence and scholarship and legitimacy in order to pass that hurdle of peer-review. That hurdle should be there – that's one of the quality control mechanisms of science. They interpret that as a bias against their revolutionary claims that we're just too cowardly to admit exist (that's the propaganda spin they put on it).

So they also have their own journals and peer-review each other, which is pointless. If you're going to have pseudo-scientists peer-reviewing other pseudo-scientists, you could publish anything. It becomes this worthless, parallel scientific literature where you can really literally get any nonsense whatsoever in print.

Fraser: I guess one of the things I don't understand as well, then, is you get newspapers or CNN and on the one hand, they'll report the latest science in astronomy or something like that, and then they'll have a psychic on or they'll have an astrologer on who's talking about what the stars are going to be doing this year. How can they have that kind of dissonance in the media?

Dr. Stephen Novella: There's a very conscious double standard in the media, and I have encountered this directly multiple times. For regular, mainstream news or political news, there are certain journalistic standards in terms of fairly presenting all points of view and all sides, basic fact-checking, etc. Not that journalists always uphold that standard, but at least there is that standard within journalism.

When journalists who are not science writers (and unfortunately the percentage of science that's being done by science writers is going down, it's more just generic journalists dealing with the science issues – there are fewer and fewer dedicated science journalists), what they typically do with a science story is if it's a mainstream science story they still treat it the same way, which is inappropriate because the premise is that all sides are equal. They present one lone crank as having an equal point of view to the consensus of the broader scientific community. They miss the fact that science is not a democracy, it's a meritocracy and not all ideas are equal.

That's a mis-application of the journalistic standard, but then they have a completely separate standard for what they consider to be "fluff" pieces or "interest" pieces. When they're dealing with astrology or psychics or demons or UFOs, they see that as really just a freak sideshow for entertainment purposes purely, that requires zero journalistic integrity. They don't have to check facts, they don't have to give the alternate point of view, if they do it's token scepticism but they don't really represent the scientific point of view. They see it as entertainment and not in the same category of journalism.

Fraser: It's bizarre to watch because you can see sometimes medical pieces butting right up against something really bizarre, like someone thinks their house is haunted, and they'll cover it – this person thinks their house is haunted, that's that, moving on.

Dr. Stephen Novella: Right, and they think if you believe it you're stupid, it's just for entertainment, so they don't have to provide both sides of the story.

Fraser: In the evolution vs. intelligent design movement, you've got the intelligent design people evolving their theories to try and be more palatable, I guess, for science. Is there something similar going on with astrology, or have they found their sweet spot and they're just hanging on?

Dr. Stephen Novella: One quick nitpick: ID is not a theory, they don't really have theories because they're not testable scientific theories, they have models. They sometimes consciously will use the term "model" because they don't want you to think that what they have is actually a scientific theory.

Fraser: Send them my apology.

Dr. Stephen Novella: Yes.

[laughter]

Astrology... has evolved somewhat. They've cloaked it in some of the more modern scientific jargon like quantum mechanics, but the underlying claims really haven't evolved. There are different flavours of astrology that it's important to recognize, there is (just to give the two big categories) Sun-sign astrology, which just refers to which of the 12 zodiac signs were you born under (are you a Leo or a Virgo?), and then there's

star or stellar astrology which they claim is more precise because they base their astrological reading on the moment of your birth and where the stars were at the moment of your birth. They need to know when you were born down to about four minutes. It's kind of arbitrary, but it correlates roughly to a degree of arc, so they figure the stars have shifted another degree, that's a new stellar astrological situation.

So those are the two big flavours of astrology, and they criticize each other. Whenever you disprove one, the other says "that's not us, you just disproved Sun-sign astrology, that's not the *real* astrology," so they always have their excuse when it wasn't their particular brand that was disproved. That's really it. There isn't this constant evolution in terms of the sophistication of the claims they're making.

Fraser: It's almost like there's a schism going on.

Dr. Stephen Novella: Yes.

Fraser: In the field – can I call it a field, should I send my apology right away?

Dr. Stephen Novella: Yeah, I guess so, it's an ideology.

Fraser: Ideology, okay. So let's... we're kind of hitting the half-way point here, and we could go on about this all day long. I think we want to switch to the other topic, just because I want to knock 'em both out in one show, and that's the UFO belief.

What has been your experience in that field?

Dr. Stephen Novella: Well, this has certainly been an interesting sub-culture within astronomy, and in fact it's been astronomers all along that have been the main scientific critics of belief in UFOs. Carl Sagan, obviously, was a prominent astronomer who took it on and wrote a very eloquent book about it. It's actually a very good read, now it's about 35 years old.

It's interesting because you can see in the 1960s the UFOlogists, the UFO believers were saying the same kind of reasoning and justifications they're saying today, but the cases they were pointing to were completely different from the ones they were pointing to today. There's been an almost complete turnover in terms of the evidence the UFO people are putting forward, but all of their rationalizations are the same.

Fraser: What kind of evidence were they putting forward back then?

Dr. Stephen Novella: The evidence is always similar in that it is mainly anecdotal, eyewitness testimony. People either saw something that they couldn't identify. Starting in the late 60s with Betty and Barney Hill, and then taking off in the 70s and later, people believing they actually physically encountered aliens and were abducted by them... and occasionally there are claims that are based upon some physical evidence like a burnt circle in a field or an alleged artifact (some melted piece of metal or something). The

evidence is always scanty, blurry, ambiguous, unreliable... but in 100 years of the claims and beliefs in UFOs, not a single piece of anything really even remotely compelling. There's nothing demonstrably alien, there's nothing that is even a clear, unambiguous photograph.

So, again sometimes if you focus too much on the minutia, you miss the forest for the trees. Sometimes you have to look at the big picture. If we were being visited by an advanced technological race from outside our solar system, what would we expect there to be in terms of evidence. I think by now we would have something unambiguous, or at least a little bit more compelling.

Fraser: How do what people think they're seeing, or think they're experiencing... I guess it kind of breaks down. On the one hand you have people seeing lights in the sky, strange objects, burns on the ground, mutilated cattle... and the on the other hand, you've got personal experiences "I met them, I was on their spaceship, they did abusive things to me." How are those explained?

Dr. Stephen Novella: There are a number of phenomena that conspire together to create the UFO phenomenon. I wrote an article about it I called the psycho-cultural phenomenon, rather than a true alien phenomenon. It's a combination of things: one, as you mentioned, people see things in the sky they cannot identify. They make the logical fallacy of what we call the argument for ignorance: "I don't know what that light in the sky is, therefore it's an alien spacecraft." They're too quick to dismiss the fact that it could be something else, something mundane, something terrestrial they're just not aware of. It could even be something unusual and bizarre. It's impossible to rule out everything.

People commonly mis-identify objects that are known. I think the most common object to be mistaken for a UFO is the planet Venus. People are not used to seeing it there. The Moon is commonly confused with a UFO: people see it under strange conditions, don't know what it is and report it as a flying ship. That has certainly always been one of the biggest contributors to this entire phenomenon of belief in alien visitation: people seeing stuff they can't identify.

There's also lots of other optical illusion components to this that people can't really judge distance, size and velocity when you're looking at something against the sky because there's no background, there's nothing for reference. Your brain can mis-interpret that stimuli and to you it may seem as if you're looking at something huge, far away and very fast moving, when in fact you're looking at something small, close-up and slow moving.

Sometimes this is very dramatic. In fact there's a case of two pilots who thought they saw a UFO when it turned out to be a wheat stalk blowing in the wind, and they didn't realize it until it moved in front of the treeline that was about 100 yards away. When it's just against the sky, they had no reference, thought it was a UFO. It drifted in front of

the treeline and they realized "woah, it's way close up and it's something small just drifting in the wind."

Fraser: I think there are a bunch of examples like the iridium satellites which can flash and then as they move, and then there's the International Space Station which can be very bright and move very quickly. There are a lot of really interesting objects.

Dr. Stephen Novella: Yes, absolutely. Our skies are filled with stuff that's terrestrial and technological. There are satellites that re-enter and can be very impressive looking as they re-enter the atmosphere and come crashing down. There are satellites now that create very bright flares, as you said, the iridium satellites. People don't realize you can see satellites from the ground, that you can look up at the sky on a clear night you can focus on dots often times you can see them moving quite quickly across the sky – those are satellites, and people don't realize that and leap to a much more entertaining and interesting conclusion than what's probably true.

Fraser: What about the people's personal experiences though?

Dr. Stephen Novella: That's another very interesting phenomenon, interesting psychologically and neurologically. For people who believe they've been abducted by aliens, a review of these cases suggests that about 60 or 70% of them just had an experience that we call sleep paralysis, which is a known, well described, neurological phenomenon. It happens in people who have certain neurological diseases like narcolepsy, and it also happens in about 15% of the normal population, usually triggered by sleep deprivation.

Fraser: I've had it

Dr. Stephen Novella: Yeah, I've had it too, when I've gone sleep deprived

Fraser: You just wake up, and you can't move but you are awake and you can see in the room (or you think you can)

Dr. Stephen Novella: Yeah.

Fraser: Then you go back to sleep and some period later you wake up again and you're able to move. It actually freaked me out the first time it happened.

Dr. Stephen Novella: It's very freaky.

Fraser: I figured out what it was and from that point on, it's never bothered me. "Oh, I'm having sleep paralysis, this'll go away."

Dr. Stephen Novella: Exactly, if you understand it, you can get through it. Although sometimes there can be an involuntary fear component to it, and it's a kind of fear it's hard to talk yourself out of, just a sort of primal neurological fear centre being activated, and it

probably has something to do with another phenomenon we know of called night terrors.

People frequently hallucinate about there being a malevolent entity in the room with them. So if you imagine I can't move, I'm paralysed, and there's something bad in the corner of my vision, that also can cause a lot of fear and anxiety.

Sometimes people can wake up from this, and it's basically a fusion between sleep and wakefulness. You may wake up, or you may also drift back to sleep, and sometimes people drift back to sleep and the dreams are an extension of this waking dream they had, so they may think "I'm in a room, I'm paralysed, there's an entity at the other side of the room" and then they dream a typical abduction scenario – floated through a wall, brought into a flying saucer and anally probed, for whatever reason. They've had that experience – it was a real experience they had, but it was a neurological experience, it wasn't a physical, external experience. That, and there are certain details to the waking dream, a feeling of pressure on your chest, the paralysis, the timing of it (it usually happens as you're falling asleep or just as you're waking up in the morning), and the fact that it occurs out of sleep that are tell tale signs that tell us that's what it was.

Other times people tell different stories. The thing about anecdotal stories is there's no way, without any external validity, to validate them. People tell stories for their own personal reasons that we can't always know.

Again if this phenomenon is a psychological and cultural phenomenon, we'd expect there to be stories without physical corroboration. If there were aliens really abducting people out of Manhattan and floating them through walls and having them for hours, we would expect eventually somewhere, somebody would catch them on a cell phone, would get some kind of piece of physical evidence, that there would be something tangible that would come out of that, and nothing has.

Fraser: Somebody would've disappeared from their bedroom and been returned hours later, there would've been frantic calls to the police while that person was gone.

Dr. Stephen Novella: Right, and there would've been an extensive search and then they'd turn up out of nowhere. There's stories of those things happening, but never the things themselves. There's never been any kind of real documentation you could sink your teeth into, ever. So the simplest explanation for that is we're not being visited by aliens.

As much as I would love that to be true, and it's not inherently impossible, we don't know how plausible it is because we just don't know how much life is out there, we don't really know what space travel is going to be like in a thousand or a million years, so it's hard to assess its plausibility, but it certainly isn't impossible. I'm perfectly willing to be convinced it's happening, I just haven't seen anything I would consider even slightly compelling.

Fraser: What about some of the strange photographs that people have been bringing up, like face on Mars, pyramids on Mars, and some of the strange objects that are being seen by the Mars Rovers. This stuff drives me crazy, so I'm setting this question up for you.

Dr. Stephen Novella: Yeah, you're giving me a softball.

The face on Mars is a classic one. A lot of people who are looking for something strange to find are poring over hundreds of thousands of NASA photographs and when they see things (again they're data mining in a way), when they see patterns they assign significance to those patterns. The most common pattern we like to see, by the way, is the human face. Our brains have a huge part of our visual cortex dedicated to looking at human faces, so it's not surprising we tend to see that pattern everywhere in random noise.

So yeah, in the Cydonia region of Mars, a very low-resolution photograph from the 70s, somebody thought it resembled the human face: boom. Face on Mars – it's an ancient alien race, maybe our ancestors built it... later on there are high resolution photographs from subsequent Mars missions, and guess what: it looks like a mountain, a mesa. The details that made it look like a face turned out to be a trick of shadows or lighting. Sometimes it was even just an artifact of the photograph, you know those little dots that are dropouts of data points in low-res photograph, and one happened to look like a nostril, just by coincidence.

Fraser: I think it still looked vaguely face-like, but you figure with the number of mountains there are on Mars, something's gotta look like something.

Dr. Stephen Novella: Yeah, well you look at it and first of all it looks like a naturally formed formation. It does not look like anything that's been carved: there's no straight lines, nothing unnatural about it at all. You can kinda see a human face in it, but again that's just our brain's hardwiring at work. It's trying to impose our most favoured and familiar pattern onto the random noise that we're seeing.

It's just like the old man in the mountain in New Hampshire. It's just a bunch of rocks, but if you look at it from one side (it's fallen down now, but up until a few years ago) it looks like a face of an old man. It's just a jumble of old rocks, but our brain likes to see it as a face.

The high-res photographs clearly show this is not a structure. It is not something built by an intelligent being. This is a mountain that happens to have some features which happen to evoke a vague human face, which is very easy to do given our predispositions.

Fraser: Now there's one general complaint that I hear from pseudo-scientists, which is (and I think it could be applied to both UFOs and astrology), why are sceptics not open-minded?

Dr. Stephen Novella: Yeah, you do hear that a lot: you hear it so often I had to write an article...

Fraser: Why can't you just be open-minded?

Dr. Stephen Novella: Yeah, I had to write an article just about that claim, to really put it to rest at least in writing because we hear it so often. It depends on how you define open-mindedness. From my perspective we are completely open-minded because I have the same criteria and threshold for evidence and logic for any claim. I don't discriminate in the bad sense of being biased against any idea a priori.

You can convince me of anything as long as the evidence and the logic are a match to the claim. If something is demonstrated to be true, I'll apportion my belief according to the evidence. If something is shown not to be true, then I'll withhold my endorsement of it.

It is actually the true believers, the people who believe in the paranormal, who are closed-minded. They are absolutely and utterly closed to the possibility that their belief is wrong, and they demonstrate that closed-mindedness by dismissing evidence they don't like, by not accepting what the evidence is really saying.

Fraser: I guess that's one of the real advantages of science, this open-mindedness. Your'e hoping for some kind of evidence that proves you wrong. I would love for there to be evidence of UFOs, and the moment there's an artifact, the moment there's some good photographs, the moment there's some verifiable stuff out there, I'm a believer.

Dr. Stephen Novella: The scientific community will be all over it. The fact that they're not is very telling, because it's just not up to the work-a-day, every day standards of logic that scientists have come to respect.

Fraser: That's great Stephen, thanks a lot. I think we put both of those to rest.

Dr. Stephen Novella: For once and for all right?

[laughter]

Fraser: For once and for all! Case closed! But hopefully we can point people at that when we get the questions in the future then, that's great.

This transcript is not an exact match to the audio file. It has been edited for clarity.