
# Opinion Science Podcast

*Hosted by Andy Luttrell*

## Directing Attention with Anthony Barnhart

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**Erik Tait:**
I was performing five, six nights a week at the Comedy Barn when I was a junior in high school. I'd go to school during the day, and then drive up to Pigeon Forge and perform in a comedy show for a lot of people looking for some hillbilly laughs, and then I'd go back to school in the morning. So, other people were like working at Starbucks or Panera Bread and I was juggling and eating fire.

**Andy Luttrell:**
That's Erik Tait. He's done all sorts of interesting things in his career as a performer.

**Erik Tait:**
A lot of spoon bending in my early days, coin magic. I thought I was gonna be a mind reader. But for the last six years I've basically been focused on card magic.

**Andy Luttrell:**
Card magic. One of those weird artforms that's practiced both by uncles who learned some trick in a bar and by true masters of their craft. Erik is the latter and that's not just my opinion. It's a settled fact that Erik is one of the card magic greats. This past summer, he placed third in the card magic competition at FISM, F-I-S-M, the Fédération Internationale des Sociétés Magiques. I obviously don't speak French, but nevertheless, FISM is a huge deal in the magic world. It's like:

**Erik Tait:**
The Olympics of magic. It is the most prestigious and most difficult competition for magic in the world.

**Andy Luttrell:**
I mean, it's incredible to qualify to compete at this thing, let alone place in card magic. Maybe the most difficult category. Erik is the first American in 20 years to win a prize in card magic and only the fourth American to do so ever.

**Erik Tait:**
When you first get into magic, one of the things you quickly heard about was, "Oh, this person's a FISM winner." And you were like, "What's that?" And they were like, "Oh, they're basically a

magic Olympian. This is a person who has won a huge prize." And it was one of those, "Oh, okay, so the people who win it are legends. They're like the greatest magicians of the age."

**Andy Luttrell:**
And so, this was never the kind of thing Erik expected to actually be a part of some day. Even now, he's self-deprecating when he talks about his big accomplishment.

**Erik Tait:**
FISM winner, Erik Tait. No one saw that coming.

**Andy Luttrell:**
But he had developed this act that was gaining traction in the magic world, a game of three-card Monte with invisible playing cards. Cards appear and vanish as two volunteers place bets on where the queen of diamonds will turn up. He performed it on Penn & Teller's TV show a few years ago and some people started to say, "You know, you might think about taking that to FISM." But here's the thing about magic: It's hard to do. Don't let the plastic Costco magic kits fool you. Erik took this competition very seriously.

**Erik Tait:**
It was really, really intense leading up to it, and especially in the weeks leading up to it, it was even more intense. Performing the act a lot in different venues. I performed the act 38 times in seven days at The Magic Castle to some of the best magicians in the world. Working with my therapist to conquer nerves and getting music composed, getting my outfit tailored, getting custom playing cards that were made specifically for it, manufacturing my table to my physical standards.

**Andy Luttrell:**
Because why leave anything to chance? The act involved complicated sleight of hand, careful scripting, and magic is one of those things that it's a wonderful and compelling mystery. But if you mess up even a little tiny bit, the whole illusion falls apart. And at FISM, you only have one shot and a few minutes to show the world what you're made of. So, like this table he built, it's not fancy. It's not some souped up magic machine with hidden flaps and mirrors. It's just a table. But having a standard table to practice at, the same one he would perform with, it just cut out some variables. When he reaches down surreptitiously with his hand, he knows exactly where on the table he's gonna land.

But the thing about bulky equipment is that you put your fate in the hands of the airline taking you to the competition.

**Erik Tait:**
Thousands of bags were being lost every day as they went through the Toronto Pearson Airport.

**Andy Luttrell:**
Because of the pandemic and the general chaos that it caused for airlines everywhere, you couldn't just expect your stuff to be heading to the same place you were.

**Erik Tait:**
The table is big enough that you have to check it. There's no way to take it as a carry on. And it flies in a 77-key piano case, so it just often flies like… The airlines treat them like golf clubs. So, what I did was I took precise measurements of the entire table and then I located all of the Home Depots and Lowe's in Quebec City where we'd be performing with the idea that if I showed up and the table didn't, I could go and buy power tools, and the wood, and the hardware required to build a duplicate of the table. And I had put an Air Tag, and Apple Air Tag, in the luggage itself so I could watch it. When the airplane took off from Toronto to Quebec, I actually watched as my table's Air Tag was left on the tarmac.

So, I watched myself fly away from the table, which was very concerning.

**Andy Luttrell:**
So, he gets there, no table. No table the next day or the next. No chance for precious practice right before his big performance. He's literally getting ready to head to a Home Depot when his table finally shows up.

**Erik Tait:**
I didn't realize I had such an emotional connection to a piece of furniture.

**Andy Luttrell:**
Okay, so what am I actually getting at with all of this? Well, you've probably heard that magicians use something called misdirection. To make it seem like you can do the impossible, you need secret technical methods to hide, transport, and retrieve various things. But you also really need to have mastered a decent amount of psychology to make sure that people aren't looking directly at where the secret stuff is happening. The practice, the scripting, the table, they were all there to help Erik look as natural as possible while under the surface he was doing complicated sleight of hand and directing our attention.

**Erik Tait:**
There's a lot of muscle memory involved in being able to look at someone in the eye and hold their attention and focus it in areas where I wanted to while my hands did something that I couldn't look at. I mean, magic is all about reducing the variables because you are ostensibly not in control, even though you are in control, and so what can you do to reduce the number of variables so that you can create the magical effect?

**Andy Luttrell:**
So, in some sense Erik is in control because he knows just how to manipulate the cards. I mean, magicians even have this phrase "card control" to talk about all the ways in which they have power over the deck. But it's the other kind of control that I'm interested in as a social scientist: the control magicians have over people's attention.

**Erik Tait:**
Attention is at a certain level a tangible thing that I can direct and just as a brief example, there's a concept called bouncing the eyes, and so what I can do is I can move the deck in a particular way and then move my head up to look you in the eye and it will almost force you to lift your eyes off

of my hands and look me in the eye. And at that point, when you're not looking at my hands and I'm aware of where your attention is directed, I can do anything I want. But at its very core, misdirection is not getting you to look somewhere you shouldn't. It's getting you… It's putting your attention somewhere I want it. Because if they can look anywhere, then they might look at their phone and they might not watch the show, and they might miss elements that make something magical.

You know, if I tear a piece of paper in half and I put those two pieces back into one hand to hold onto them as I do something else, and then I restore those two pieces into one piece of paper, if you miss the moment where I tear them in half, then the act of restoring them is no longer magical. It just looks like I unfolded a piece of paper that has been folded from the beginning. And so, being able to focus somebody's attention on the act of tearing the paper is as important as being able to make them look at me picking up a magic wand in order to hide the fact that I'm doing something sneaky to restore the torn piece of paper.

**Andy Luttrell:**
You're listening to Opinion Science, the show about our opinions, where they come from, and how they change. I'm Andy Luttrell. And as my friend Erik just teed up so nicely, today we're talking about lessons we can learn from the world of magic about the psychology of attention. Mostly it's an opportunity to talk about the psychology of magic, which I just happen to like, but I do think it fits with this show. Our opinions orient our attention—we focus on things that fit with our views and values. And our opinions can be shaped by communicators who know where to direct our attention.

As much as we might want to pay attention to everything, we can't. Our attention zeroes in on whatever we think is relevant in the moment, and we miss other stuff that isn't relevant…even big, otherwise obvious other things. Probably the most famous experiment on this asks people to watch a simple video of people passing basketballs between each other and count the total number of times people wearing white shirts pass the ball. It's not easy. There are six people in the video, two basketballs, and they're moving around constantly. In the midst of this chaos, though, someone wearing a full gorilla costume walks into the group, looks dead into the camera, beats their chest, and walks off screen. You would absolutely think this is something you'd notice. But lots of people do not. The experiment has come to be known as "The Invisible Gorilla" experiment, and I still remember watching this video in my AP Psychology class in high school, and I had absolutely no idea that a gorilla played a prominent role in the video. My attention was on the basketballs. I had been misdirected.

My guest today knows a lot about the psychology of attention and how magicians have been harnessing it for centuries to make it seem like they can do the impossible. Dr. Anthony Barnhart is an Associate Professor of Psychological Science at Carthage College, and he's also a part-time magician. In grad school, he connected with cognitive neuroscientists who were writing a book about lessons from magic, which they called *Sleights of Mind*. I have the book here. On page 26… "Magic Tony is our mentor and magic instructor, and we're meeting him for another rollicking session of 'teach the scientists how to prestidigitate." Anyhow, I met up with *the* Magic Tony at a conference recently to get the scoop on his research and what magicians and scientists can learn from one another.

Tony and I were catching up, and we jump right in, so a quick note to orient you. I've been into magic for a long, long time, and I've been especially interested in a form of magic called *mentalism*, which is essentially using tricks and deceptions to give the illusion of reading minds. It had a lot to do with my interest in psychology. Anyhow, we were chatting about mentalism and other things as we got rolling, so now that you're caught up, let's jump into my conversation with Tony Barnhart.

**Andy Luttrell:**
But I think for the purposes of this, like very broad strokes intro, and the question being what is the psychology of magic tell us about what it means to be a person, right? That's kind of the… And it's like in what ways do knowing about the psychology of magic tell us about our ability to be tricked into beliefs that aren't really true? Because that is like word for word almost out of my personal statement to grad school. It occurred to me that that was what was interesting to me, that people were clinging to beliefs with a sense of certainty when you know full well there's no good reason to have reached that conclusion. But like logically, if you're just buying what's in front of you, of course you'd reach that conclusion.

And that's why misinformation is such an important issue, because it's like if it's true, then you are reasonable in forming the belief that you formed. The problem is that that was never true to begin with.

**Anthony Barnhart:**
That's right.

**Andy Luttrell:**
In the same way that like this person was never able to read minds.

**Anthony Barnhart:**
Sure.

**Andy Luttrell:**
And yet, you're not wrong to go like, "Well, if what I'm seeing is true, because it for sure looks true, it's totally fine for me to believe that it is."

**Anthony Barnhart:**
I think I'll push back on you a little bit in your assertion that mentalism is doing something different than what I'm studying, because ultimately I think every piece that I've published that has looked at attentional control in the face of misdirection can be distilled down into the amount of narrative control that the magicians have over the experience and magic, right? What mentalists are doing is creating a narrative that encourages the audience to adopt assumptions that turn out to be wrong. That's exactly what magicians are doing. But the way that magicians use narrative is also to encourage the audience to guide their attention toward the things that they think will be relevant, away from the things that they assume to be irrelevant.

Which is exactly what mentalists are doing, right? The narrative of mentalism is still moving the audience's attention toward the things that allow the effect to occur and away from the secret methods. The methods are just less overt.

**Andy Luttrell:**
Yeah. And the attention maybe is at a different level of abstractness possibly, right? In a coin trick, your attention is very specifically where are your eyes relative to where the coin is. In mentalism, it's more like where is your expectation in contrast to what I actually do already know about you?

**Anthony Barnhart:**
Sure. Yeah. I would agree with that. I would also suggest that mentalism probably involves more misdirection of attention toward memory processes, right? Some of the work that I'm doing now is really exploring this constant flux of attention deployed to the external word versus attention deployed toward working memory processes, and maintenance of contents in working memory, and attention is also used for searching long-term memory. And so, I think misdirection is ultimately the same thing in magic and in mentalism, it's just using more outward manipulation of attention in magic and mentalism is using more inward manipulation of attention.

**Andy Luttrell:**
Are there examples of misdirection outside of the magic sphere that you would point to? You'd be like, "Well, misdirection is also this other thing that you see every day," or whatever.

**Anthony Barnhart:**
Sure. Oh, let's see. I mean, it seems like there are all sorts of concrete examples in politics, right? I mean, politicians are always using narrative to encourage you to focus on certain aspects of their behavior and away from other aspects of their behavior. And to build an internal simulation of who they are as individuals that probably doesn't exactly match who they are as individuals. And that's all that magicians and mentalists are doing. They're encouraging an inner simulation of the world that allows the magic to occur but doesn't match reality.

**Andy Luttrell:**
Hm. It reminds me of work in media and communication on framing, right?

**Anthony Barnhart:**
Sure.

**Andy Luttrell:**
I frame this issue, like ultimately, at the end of the day this is an economic issue, versus at the end of the day this is a civil rights issue.

**Anthony Barnhart:**
That's right.

**Andy Luttrell:**
The issue's the same, but I'm… I mean, misdirect is hard because there's like the thing I don't want you to know, which is possible, but I'm directing attention to you should think of this in this way.

**Anthony Barnhart:**
That's right.

**Andy Luttrell:**
And maybe I am misdirecting if I'm like, "Well, secretly I know why I don't want you to believe this," but I'm gonna frame it in this way that makes it palatable and acceptable to hold this opinion.

**Anthony Barnhart:**
Yeah. Well, and it's very much akin to functional fixedness, right? Once you give people one way to interpret a set of events, that sort of sticks with them, and it makes it harder for them to detect alternative explanations for what they've experienced. I mean, people like Cyril Thomas have shown that if you give people a cruddy, obviously wrong explanation for how a magic trick occurred, it still facilitates the deception because now their mind's stuck on this dumb thing that you've suggested to them that's literally impossible, but they can't get past it to see the true method. It actually… It interferes with their ability to actually work out how a magic trick is accomplished.

**Andy Luttrell:**
Which may be some of the success of framing these mentalist things is psychology, right? Like I give you a very clear explanation, even though you go, "Well, that actually doesn't make sense. The fact that there was a bear on the door when I walked in, that's really what…" But you go, "Well, but I planted that seed," and now you go, "Yeah, but I don't know, what else could it be if it wasn't that bear on the door?"

**Anthony Barnhart:**
That's right. Yes. Yeah. Absolutely.

**Andy Luttrell:**
So, this is just a very like you're a cognitive psychologist and my question to you is what is attention? Before we even get like where does it go, but what is it? How do we actually think of what attention is?

**Anthony Barnhart:**
Yeah. Okay, so this is a hard question, and in my cognitive psychology class we devote days to trying to come up with a suitable definition of what attention is, and I think the problem is that attention is an umbrella term that's been used to describe a bunch of different processes. But if I had to come up with one definition that I think is satisfying, I think attention is a readiness for information processing. A readiness, it's a predictive mechanism for when you think information will be available to process and where that information will live in the environment or in your mind. So, it's a readiness for action or a readiness for processing. So, if I misdirect you spatially by making some big move, like the gross, obviously not used kind of misdirection, where I make a big gesture over here, well, that action tells you this is likely to be a location where there's going to be useful information in the future, so your attention gets ready to process information at that location and in specific moments in time, and tries to filter out the things it deems irrelevant to increase the gain on that information.

That's my best attempt at giving a short definition of attention.

**Andy Luttrell:**
And to clarify assumptions, is the prevailing view that attention is limited?

**Anthony Barnhart:**
It is. So, yeah, Daniel Kahneman's capacity theory is still a component of modern theories of attention, and he was one of the first to assert that attention is like this limited resource that you have available that you're trying to optimally distribute across the kind of pressures, and that once you run out, you will begin failing at stuff.

**Andy Luttrell:**
So, yeah, that's even capacity for any attention, but I was even thinking like by definition, if my attention is here, it cannot also be there.

**Anthony Barnhart:**
Yeah. I think the prevailing view is that multitasking is mostly a myth. You aren't effectively dividing your attention between locations, or between your inner world and the outer world. Instead, you're engaged in fast task switching, shifting your attention back and forth between locations, or between the external world and your working memory inside. I think that's where we're at right now.

**Andy Luttrell:**
Okay. We've gotten ahead of ourselves.

**Anthony Barnhart:**
Okay.

**Andy Luttrell:**
What is your magic origin story?

**Anthony Barnhart:**
Yeah. I wish it was a better story. When I was seven… How old were you?

**Andy Luttrell:**
I want to say like four or five is the story that I've told.

**Anthony Barnhart:**
Oh, okay. Wow. That's early.

**Andy Luttrell:**
I think it was like a magic set that I got, but there are home videos of me doing very poorly conducted magic tricks as like a four or five year old.

**Anthony Barnhart:**
Okay. All right. Well, I was seven, and I was on a swim team, and the coach just happened to be a magician, and I liked him real well, and his family was friendly with our family, and so he started giving beginner's magic lessons at the local rec center, and I took them, and loved it, and kept it up, and that's it. I wish-

**Andy Luttrell:**
So, in your heyday, what was the… At your most magic, what were you doing? What did that look like?

**Anthony Barnhart:**
Yeah. So, I did a lot of performing. I did a lot of paid… I mean, I effectively paid for college doing magic, but the thing that I was most passionate about was competitions, magic competitions. I did that whole circuit with a kind of theatrical stage act, manipulationy sorts of things, but narrative based, which was unique at the time. I was telling a story. That was the thing that brought me the most passion, like building this tight routine that had narrative structure, and that had natural segues between effects. That was where I derived most of my pleasure.

**Andy Luttrell:**
Not just birds with techno music.

**Anthony Barnhart:**
No birds. Nary a bird. Filthy.

**Andy Luttrell:**
So, what was the manipulation act like?

**Anthony Barnhart:**
I mean, billiard balls were the biggest part of it. It was hard to motivate those billiard balls.

**Andy Luttrell:**
To make a story.

**Anthony Barnhart:**
Yeah. To make a story about those. But you know, there was a lot of like pseudo-hacky stuff, too, that probably kept me winning things, like there were a lot of canes involved, and that was the era where everybody did a dancing cane, and boy, howdy, did I do a mean dancing cane.

**Andy Luttrell:**
I was gonna say, I remember early on having the idea for a dancing cane that was a pool cue that you would then circle in with a billiard act.

**Anthony Barnhart:**
Nice.

**Andy Luttrell:**
I should have consulted on your act.

**Anthony Barnhart:**
But yeah, I actually had luck with that act. I won Abbotts, the junior at the time, when I was in the circuit, and I came in like third at IBM once, and I made the cut for the SAM national stage competition, which was sort of invitation only. So, I did okay for myself. It was a good time.

**Andy Luttrell:**
Yeah. And what does it look like for you now?

**Anthony Barnhart:**
It's slowed down. I mean, it stopped when I went to grad school, but then when I started taking up magic as a research focus, I began performing again and I started making a little money on the side as a performing magician in Phoenix. I told myself that I wouldn't start marketing myself as a magician in Wisconsin until I had tenure, and then I got tenure, and then there was a pandemic, and so I've not started marketing myself as a magician. I despise my act, so I had a sabbatical a few semesters ago. One of my plans for the sabbatical is to build a new act. I've got a vision. It just takes time to do it. But again, pandemic, instead of building an act I found myself at the dining room table with my kid doing virtual kindergarten.

**Andy Luttrell:**
Yeah. So, when you got to grad school, that was not… Your interest was just in psychology.

**Anthony Barnhart:**
Yeah. I went to grad school to be a language researcher.

**Andy Luttrell:**
Which you still do some of.

**Anthony Barnhart:**
I still do some. Yeah. But I was really lucky to find myself with a mentor who was a real renaissance man, who was willing to think about a variety of ideas and go in interesting, weird directions, and facilitate his students going in interesting, weird directions. And so, my first three years of graduate school I was primarily a language researcher studying handwritten word perception. How do we look at messy handwritten words and know what the heck those words are? It's a really difficult perceptual process. But then I started seeing people publishing work that used magic in the laboratory or that took its inspiration from the strategies of performing magicians. And I thought there's nothing special about me to study handwriting, right? I don't have a leg up on anybody. I can read the prior literature just like anybody else and come up with some hypotheses, but I have all this training and knowledge in magic that other people in psychology don't have, and that could give me a leg up if I actually begin applying what I know as a magician in the laboratory.

So, I kind of sought out who the movers and shakers were in this emerging area and realized Steve Macknik and Susana Martinez-Conde were just down the road from me at Barrow Neurological Institute in Phoenix. I was at Arizona State University.

**Andy Luttrell:**
Oh, so you did not… They were not… You didn't go to grad school to work with them.

**Anthony Barnhart:**
I did not. I did not. No. So, I reached out to them and told them who I was and what I was up to, and that's when we struck up this long-term collaboration. They were thinking of writing the book Sleights of Mind at the time, and so I started giving them magic lessons, and contributed some ideas to the book, and went on pieces of their book tour with them to hawk the thing. The kind of interest that that garnered from the scientific community persuaded me that there's meat on the bone here. This is I think not just a fly by night fad in psychology. There's actually some things that psychologists can learn here. And there are definitely tools within magic that can make our science more powerful and more effective.

So, it became a much larger part of what I did, and my mentor was fully supportive of this, and my entire dissertation was a series of studies on how magicians can manipulate attention in time rather than in space. And I had a great committee, including Dan Simons, the invisible gorilla guy, who obviously has an interest in magic. Magic is totally relevant to the things that get him excited. And so, nowadays about two thirds of what I do in the lab is inspired in some way by magic or uses magic as a tool for studying attention and perception, and about a third is the handwriting stuff, which is harder to get undergraduates excited about. They don't even write in cursive anymore.

**Andy Luttrell:**
I did wonder. You seem to have had a bunch of students work with you on this stuff. And there's a version of the story where I go, "I think it would be…" It's like niche enough that they would be like just anyone wants to work, but it has been of interest to students. Do you find that students seek it out because it's of interest? Or they just go like, "I need research experience and I'll work with the magician."

**Anthony Barnhart:**
Oh, no. I think there are very few students who are just showing up to the lab because they feel like they need to get some research experience. So, I have tricks for recruiting students. I frequently teach a course on the cognitive science of magic and that course serves two purposes for me. I do a different reading list every time, all modern works, thus forcing me to read the things that I haven't gotten to in the last year, and it's a way to get students up to speed and to recruit students to work in the lab. After students come out of this class, they have a good sense of the state of the state of this research and they kind of get how my lab approaches this set of research questions. So, after that class, they know whether this is something they would like to think about more deeply or not, and so it's a really powerful way to get highly motivated students into the lab.

**Andy Luttrell:**
So, I guess the question is like what is the function of this research, right? There's a world where you go, "We study this to make magicians better at what they do," or, "We just find tools," right? Like, this is like, "Oh, we can use tricks to study attention," or some hybrid there, where there's wisdom in magic that sort of could inspire hypotheses about us.

**Anthony Barnhart:**
Sure. So, I think I see two main reasons for this kind of research, especially in the domain of attention. The first is that almost every attention task that's ever been used is really artificial. Psychologists have come up with these very strange laboratory tasks that don't reflect any of the pressures that we experience out in the real world. And so, it's unclear how much we are actually understanding how attention operates in the natural world, so magic I think provides a relatively ecologically valid way to study some of these phenomenon.

I'll go deep in the weeds here. There's a phenomenon called the attentional blink where if you have people watching a computer monitor where stimuli, like usually letters and numbers just flash by very quickly, like a series of them back-to-back-to-back-to-back, 100 milliseconds each, and people are searching this stream of information for some target, like a specific letter or number. If they detect a target and another target comes 200 to 500 milliseconds after the first one, people are functionally blind to the second target. It's weird. It's a weird finding. As far as I can tell, it has no relevance to the real world. I mean, we did not evolve in a world with quickly changing stimuli like that, with televisions, but it's led to this cottage industry of people studying how attention operates in time. But rather than studying how attention operates in time, they're studying the psychology of the rapid serial visual processing task, right? It has no relevance to the real world.

But when a magician tells a joke in his act, his or her act, and in the moment that the audience understands the joke he carries out a piece of sleight of hand right in front of their faces and they don't see that sleight of hand, I believe that is an instance of the attentional blink in the real world. So, if we take this rapid serial visual processing task and try to distill it down to its most important pieces, it's really about extracting meaning from the world, finding meaning from the world and encoding it in memory.

Well, when a magician tells a joke, you begin extracting one piece of meaning from the world and he turns it on its head because jokes don't play out the way you expect them to, and so in order to understand a joke you have to travel back in time and reinterpret the setup in light of the punchline, and that failure in your expectation about how this language is going to play out is extraction of unexpected meaning from the world that shifts attention inward toward working memory processes, thereby blinding you to this thing that happens out in the visual world. Conceptually, that's exactly what's happening in the attentional blink. And so, examples like this from magic I think can begin to ground some of our abstract psychology in the lived experience of people and in real world pressures.

So, I think those are maybe the two greatest benefits of what I do.

**Andy Luttrell:**
Are there examples of insights that come from… Because that's an example of we started with the cognitive science and then we see how that plays out, like magic has sort of been an illustration of this. My impression is that a lot of this work sort of looks at magic for insights to test. Are there examples that come to mind of that approach, where we've ended up learning something about being a human person in the world because we paid some attention to how magicians have been thinking about what they do?

**Anthony Barnhart:**
I think I have. One example comes to mind readily that I think is somewhere in between those two. So, in fact, this came straight from my dissertation work, so I was exploring the role that auditory rhythms like music or speech play in visual awareness, and in psychology there's a phenomenon known as attentional entrainment, where if there's a rhythmic event in the world, whether it be an auditory rhythm like the sound of a galloping horse, of a visual rhythm like the picture of a galloping horse, your attention, the rhythms of your attention try to align with the rhythms of that event that's unfolding. Again, to optimize perceptual processing at moments when there's important stuff out there and to relax in between because that's economical.

Well, there's a vast psychological literature on this, but I don't think… To the extent that magicians are exploiting this, they're rarely doing it within one sense. They're not using visual rhythms to influence visual awareness or auditory rhythms to influence auditory awareness. They're usually using auditory rhythms to influence visual awareness. And that is something that psychologists hadn't studied. There was one paper that sort of touched on it and did it in a bad way. And so, I set out to explore if the way that magicians use rhythmic speech and music can impact people's detection of visual events that they aren't meant to detect because it would give away the magic.

And so, we did a series of experiments and we showed that the mere presence of an auditory rhythm, like just tones that play rhythmically, not like any melody or anything like that, but if they're a consistent rhythm that can impact your detection of a visual event. If the visual thing occurs in between tones, you're slower and less accurate to detect it. Presumably your attention just automatically entrains to this auditory rhythm and that spills over into visual awareness. So, this really does continue to support Kahneman's capacity theory that attention is like this singular resource that we try to optimally divide across all of the senses. It's not like we have a separate pool of attention for vision, and a separate pool for audition. No, it's like one thing we're dividing across all of our senses.

**Andy Luttrell:**
So, what is the magic example of that?

**Anthony Barnhart:**
Okay, so the magic example, and I guess there will be a little bit of exposure here, and exposure for a person who could hurt me very badly. My favorite example is David Williamson's striking vanish. So, in the striking vanish, it's usually done with like a coin or a ball, and a pen or a magic wand, and the magician is tapping the coin or the ball with the magic wand. Rhythmically, I might add. And the coin or the ball spontaneously vanishes, like it just disappears from sight, and the sleight of hand that allows that to happen occurs off the beat. The magician's creating this rhythm

with the tapping of the pen. The sleight of hand happens off the beat. It happens quickly but not so quickly that it wouldn't be detectable. And yet people are blind to it, presumably because their attention aligns to the rhythm.

This is maybe an imperfect example because there's a visual rhythm and an auditory rhythm at the same time, but it's like the most clear instance of this that I can come up with. There are also anecdotal accounts of magicians who had to activate a trap with their foot during a stage act, and there was music playing, they were kind of dancing, and they'd always get caught hitting this button with their foot, and somebody said, "Well, why don't you do it off the beat of the music?" And they started doing it off the beat and nobody caught them anymore. Of course, I could never… It might just be apocryphal. I could never track down the source of that story that I've heard told a million times.

**Andy Luttrell:**
But it has implications I even think for cinema storytelling, right? Like how do I score something alongside-

**Anthony Barnhart:**
Absolutely.

**Andy Luttrell:**
… what I'm presenting on screen? In that case, I want to draw attention, so the implications for this are probably going both directions, right? If I want to obscure some information, I can utilize this psychological principle.

**Anthony Barnhart:**
Exactly.

**Andy Luttrell:**
But if I want to draw attention-

**Anthony Barnhart:**
Yep. Put it on the beat.

**Andy Luttrell:**
Put it on the beat.

**Anthony Barnhart:**
Absolutely.  Yeah. And so, are these big effects? Oh, no. No, they're not big effects. But they are one in a series of small little nudges that magicians can use to encourage an audience to attend when and where they want them to. And I think magicians have a pretty keen sense of additive logic, right? They think that there are all these subtleties, like the rhythm, and body posture, and stuff like this that they can pile on top of each other and that they'll each have an additive benefit, and in the end you'll have a superior deception.

Of course, this also opens the door to a lot of superstition, right? Magicians are kind of informal cognitive scientists who have hypotheses about the mind that drive the techniques that they use to deceive. You have to have a guess at what's going on in a spectator's mind in order to figure out how to deceive it. But oftentimes they aren't actually set up to appropriately test the hypotheses that they have about the mind. Because if you pile these subtleties one on top of the other, there's no way to extract one of them and manipulate just that one to see what effect it has. So, I suspect there are a lot of places where magicians and maybe even mentalists are becoming very superstitious about their techniques, believing that every added subtlety has an impact on the greater deception.

And so, as far as magicians are concerned, I think that's one of the other benefits of this research program. Scientists have the tools to dissect these subtleties and do the research that allows us to evaluate whether each one has a real added benefit. I could imagine some of these subtleties might actually harm deception and we'd be none the wiser because we just can't do the… Magicians just can't do the real research to evaluate it.

**Andy Luttrell:**
It's funny, because I feel like the common story that gets told of the science of magic is like, "Magicians have been around for centuries and who would know better how people's attention and beliefs are formed and are guided than magicians who have come to this understanding through hours and hours of practice?" And so, what I wonder… But at the same time, I have seen and read lots of garbage from magicians who are like, "Okay. Well, when you do this, of course you have to do this, and if you're trying to misdirect them, make sure you throw your hand up in the air for half a second on the left-

**Anthony Barnhart:**
Jazz hands are even better.

**Andy Luttrell:**
Yeah. Big movements and small movements.

**Anthony Barnhart:**
Curved movements.

**Andy Luttrell:**
And say this instead of this. And ask them their name and tell a joke and put their drink on the left side of their close up mat. And so, that always strikes me as like it sounds wise, but that kind… To me, it's sort of like, "I don't know. Is it real?" So, in your estimation, how much should we buy into this narrative of magicians are the ones with the secrets and they're the ones telling psychologists what are the insights that should be looked at?

**Anthony Barnhart:**
Yeah. I mean, I think magicians do have some deep knowledge about psychology, but the problem is that magicians only care that their manipulations work, not why their manipulations work or how their manipulations work. And so, I think magicians might observe that some manipulation has the desired effect, but then they develop their own little theory for why it's the case, and it's

that theory that gets problematic and isn't grounded in any kind of real research. It's really folk psychology that usually tells a good story. Other magicians find it accessible and will agree or disagree with it, but it hasn't been effectively evaluated.

So, I do believe that magicians have great insights about psychology. I wouldn't be studying these things if I didn't. But I also think there's a lot of room for superstition there. And so, it will not surprise me if some of the hypotheses that I explore just fall flat on their faces.

**Andy Luttrell:**
So, when you and others are looking at misdirection, what I'm really hoping for is to paint a picture of like what does actually one of these studies look like, right? When scientists go, "We're gonna study misdirection," what does that look like and how can we infer anything from these studies? So, if you want to just pick an example of a study that's sort of to you sort of gives us information about attention using magic as a stimulus or whatever, right? Carte blanche. Do what you want to do. But sort of walk us through what is it that people are doing and how are you taking their responses as meaningful?

**Anthony Barnhart:**
Sure. I think there are two approaches to doing this. You can take some phenomenon from magic, try to distill it down to its fundamental properties, and then come up with a well-controlled, probably artificial laboratory task for studying them. So, I did exactly that with the rhythm stuff that I was telling you about. I didn't… No magic appeared in that set of experiments. The research question was can the presence of a rhythm influence visual awareness as we think it does with magic. And so, instead of using magic or stimuli from magic, I tried to come up with a well-controlled laboratory task that could answer that question. And boy, did I come up with a painful one. Participants really despised this.

So, I had to come up with a visual task, a pretty complicated visual task, so that I could have some variability and detection of whatever this thing was, so what I came up with was the computer monitor would be filled with colored noise, where every pixel was a random color, and at some point in time a dot would appear, and that dot was also colored noise, but it was slightly yellowish colored noise, and it could appear anywhere on the screen. So, they're monitoring this messy display for this very subtle event while they're wearing headphones that play these tones, and we manipulated the onset of that dot relative to the tones that they were hearing through the headphones.

Of course, the secondary question was do you have to actively be attending to the tones for this to work? So, half of participants had to monitor the tones for an oddball, one tone that was different than all the others. The other half of participants had the same auditory stimuli, they just didn't have to do anything with them. And we found that attention to the auditory stuff didn't matter at all. Its mere presence impacted detection of this dot. So, that was a case of trying to distill the idea from magic down into something that's more controlled.

So, the other approach to doing this kind of science is actually using the tools from magic to test these hypotheses. And I did this in my… I guess it was my very first published empirical study of magic. Inattentional blindness is a familiar concept among psychologists, our tendency to miss an

event entirely if we're engaged in an attentionally demanding task. Listeners are probably familiar with the invisible gorilla demonstration from Simons and Chabris. Well, it's rare to be at a basketball game and miss a gorilla walking across the court. Not so rare to be at a magic show and miss all sorts of stuff that's happening right in front of your face. And so, I developed a technique borrowed straight from magic for studying inattentional blindness in the laboratory, and it retains the kind of ecological validity that the gorilla demonstration had but is a little bit more representative of something you might experience in the real world.

So, it's built upon a magic trick where a coin is placed on the table, covered with a napkin. Another napkin is placed on the opposite side of the table and the coin vanishes from one location and appears in the other. Well, if a participant is attending appropriately, they can see exactly how the magic trick happens. The coin visibly moves from one location to the other. But because of the narrative of the way the magic trick is presented, the structure of the routine, their attention usually isn't appropriately deployed. I use some tools of magical misdirection so that they're not just looking at the wrong spot, but they're attending at the wrong spot. I have a couple of cups that I place on top of the napkins before it's revealed that the coin has moved. I just show the inside of the cup to the audience. That's something that inspires a lot of curiosity, right? Why is he showing me the inside of this cup? There must be something relevant to it. I think that's the narrative that's going on.

Well, at one point when I'm showing the inside of the napkin, that's when the coin just slides from one location to the other. Pretty slowly in the grand scheme of things. And about half of participants are oblivious to this shiny moving object that's probably in their peripheral vision. Well, so we used video of this magic trick to explore the relationship between eye movements and inattentional blindness. We monitored people's eye movements using an eye tracker while they watched a few different versions of this, and we found that detection of the moving coin had no relationship to where their eyes were placed on the screen when it was moving. People who saw the coin and people who didn't were looking at roughly the same place.

And what that suggests is the people who saw the coin had shifted their attention away from where their eyes were placed, which is a thing that happens, but a thing we're not super aware of happening. Usually, attention shifts to a location before our eyes move there. That seems to precede eye movements.

**Andy Luttrell:**
So, hold on. You're saying eye tracker data shows you that people… We know they looked at the coin.

**Anthony Barnhart:**
No, no, no. Nope. Almost all of them were looking at the cup.

**Andy Luttrell:**
Oh, sure.

**Anthony Barnhart:**
Their eyes were on the cup that was up in the top part of the screen.

**Andy Luttrell:**
Got it.

**Anthony Barnhart:**
While the coin was moving in the bottom part of the screen. Yet half of the people whose eyes were on the cup saw the coin and half didn't. So, their eyes were in the same place, yet they were experiencing different things. Presumably because their attention was deployed differently. So, in a follow-up experiment we looked at things called microsaccades. So, saccades are like the big movements that your eyes make. The big, sort of ballistic jumps that your eyes make. But even when your eyes seem to be sort of still, when you're fixated on something, they're not really still. There are these little twitches called microsaccades and people used to think that they only served the purpose of just sort of shifting where the image is falling upon your retina so that you wouldn't fatigue photoreceptors, but it turns out there's a direction to these microsaccades, and that direction changes a little bit.

And it's been suggested that the direction of a microsaccade could point to where your attention is placed independently of where your eyes are placed. And so, our technique gave us a way to explore this hypothesis. We had to change the method a little bit so that it could become a multi-trial thing, but we found that indeed when people were fixated on the cup and had to try to attend for the coin in peripheral vision, they started making vertical microsaccades, which are very rare, it turns out. Most of your microsaccades are horizontal. But when people had to divide attention between these two locations, the stuff in the cup and the coin beneath, they very quickly shifted to vertical microsaccades, which indicated they were dividing attention between these two locations or task switching very quickly.

So, all of this started with something from magic, but it was a tool of magic that was used to study ideas from psychology. So, I think in a perfect world the way to do this science is sampling from both ends of the continuum for a single research question. So, in a perfect world we take a phenomenon from magic, distill it to its fundamental properties, test those in well-controlled laboratory tasks, but then we also sample from the other end of the continuum. We try to scale that back up to a real magic demonstration to see whether the principles that we observed in the well-controlled laboratory task hold when it's in a messier, more naturalistic setting.

So, if I zoom out on my research program, that's my ultimate goal. I think that's the way we can best understand these psychological processes and best evaluate the ideas of magicians, by exploring them under controlled and less controlled situations.

**Andy Luttrell:**
What's funny to me is that an actual… So, like you paint these… a magic show as an ecologically valid domain to see how these things play out.

**Anthony Barnhart:**
Yeah. I guess it isn't.

**Andy Luttrell:**
Whereas to me, that seems like, "Well, that's the circus. That's the playground."

**Anthony Barnhart:**
Yeah. Sure.

**Andy Luttrell:**
That's actually… That was like the original laboratory where we could say like, "What are the weird quirks of attention that we don't normally appreciate or don't normally come up when we're in the world?" But like in the context of shifting our expectations on their head, this is like the original sequence of letters on a screen.

**Anthony Barnhart:**
That's right. Yeah. It's a fair critique. Yes. There is nothing natural about a magic show except that you bring your natural tendencies to that setting, right? Everything magicians are doing is exploiting the tendencies that you use every day of your life outside of the context of a magic show, but that leads you astray in the context of a magic show. So, yeah, fair critique.

**Andy Luttrell:**
I see it, though. It's like the example of Kahneman and Tversky's heuristics, right? Like the whole point of those weird scenarios is they're crafted such that like normally we have heuristics that serve our needs, but we don't notice we have them because they generally lead us to an adaptive answer. But if I can find a scenario where if that's your bias it points you to the wrong answer and then that's the answer you give, I go like, "Oh. I know you must be ordinarily employing these heuristics in your thinking. Otherwise, in this weird, contrived scenario, you wouldn't be giving an obviously wrong answer."

In the same way you'd say sort of that's what a magic trick is, right? It's saying like, "I'm exploiting." Like you don't notice you think this way until it makes you think something impossible happened.

**Anthony Barnhart:**
That's right. Yes. I mean, and that's been one of the great tools of all these inattentional blindness demonstrations, too. People have all sorts of faulty beliefs about how their attention works. They think vision works like a video camera, accurately depicting everything that we see. Well, yeah, it may… Well, it depicts the things you see, but not the things you don't see, right? You're not aware of what you're not aware of. And so, yeah, I say that the gorilla demonstration is like ecologically valid because it's naturalistic stimuli, but it's not ecologically valid in that it was exactly designed to fool you. To shift your attention away from this obvious thing. Yeah.

**Andy Luttrell:**
So, in some ways, because what I want to know is like what is it about our everyday psychology that we learn from this stuff, right? In the same way that we go like, "What is it about our thinking that we learn from the mistakes we make when the scenarios form that way?" And in some ways, maybe the answer is just so banal because we're going like, "Well, yeah, it just goes unnoticed

most of the time." But it's when we kind of force our psychological hand that then we see it in action.

**Anthony Barnhart:**
Yeah.

**Andy Luttrell:**
But does anything come to mind as like a, "Oh," like literally, you go to a restaurant, or like you talk with your family, or something that's truly in your everyday life that we go, "Oh, I get to look at this a little differently now that I understand how people experience magic."

**Anthony Barnhart:**
I think perhaps it underscores how much we rely on our predictions about the world, right? How many times have you driven home from work, you've got like an incredibly long commute, so this is gonna get real scary fast. How many times have you driven home from work and realized that you have no memory for anything that happened on that drive, yet you got there? It shows that you were driving on autopilot. You were letting these sort of automatic tendencies drive you. You were being quite lazy, to be honest. You were being a cognitive miser. You were letting just these automatic overlearned processes drive, literally drive you home. And I think that's an extreme case, but we're always doing that. We're always taking the path of least resistance to making decisions in our daily lives, and moving our attention about the world, and it's those… That's what magicians are manipulating. They are encouraging you to use your assumptions, to go on autopilot, to take the path of least resistance.

How do I make you pick the card that I want you to pick? I make it easy to pick that card, right? So, I think one thing that we can learn about ourselves from the study of magic is just how often we're going on autopilot. How many of these unspoken assumptions are driving our daily experience of the world, and our behavior, and our decision making, and these are these built-in, overlearned tendencies, like heuristics and biases, are very easily exploited by magicians because they've become so automatic we aren't even aware that we're making these assumptions.

**Andy Luttrell:**
Yeah, because you framed attention as a predictive model.

**Anthony Barnhart:**
Yep.

**Andy Luttrell:**
And so, what that just means is that we're constantly predicting the future.

**Anthony Barnhart:**
Yes.

**Andy Luttrell:**
But we're doing it in a way because we've been there.

**Anthony Barnhart:**
Exactly.

**Andy Luttrell:**
We go, "I know how this works." Which, does that imply that we're more easily fooled in familiar environments than unfamiliar ones?

**Anthony Barnhart:**
Perhaps so, because we can make stronger predictions, and those predictions can be used against us.

**Andy Luttrell:**
Yeah. We more effortlessly generate those predictions.

**Anthony Barnhart:**
That's right. Yep.

**Andy Luttrell:**
Whereas if we're in a new environment, we're vigilant. We're on guard. We go, "I don't actually know the rules of this environment."

**Anthony Barnhart:**
That's right.

**Andy Luttrell:**
So, I'm paying more attention, and so presumably that's why people get swindled by close friends-

**Anthony Barnhart:**
Absolutely.

**Andy Luttrell:**
… or people who seem like, "Oh, you're in my club," or think of Bernie Madoff, right? How much of that was just like, "Oh, this kind of feels like my uncle."

**Anthony Barnhart:**
If you have confidence in that person, you will just go on autopilot.

**Andy Luttrell:**
Right. You go, "I know how this works. I know who you are. I understand." Whereas if it's like someone approaches you on the street that you don't know in a city you've never been in-

**Anthony Barnhart:**
Yes. Exactly.

**Andy Luttrell:**
I bet it's harder to get taken in by a similar kind of scheme. Because there's no prediction to exploit.

**Anthony Barnhart:**
That's right. And so, I think magicians inherently know this because I think the early pieces of magic shows or mentalism shows are built around establishing a rapport with the audience, right? Letting the audience know who the performer is, give them a sense that they're friendly, or make the performer accessible to the audience so that the audience can begin making predictions about the performer and sort of also let down their guard a bit, right? You can be more easily influenced by your friends. You're gonna follow their sort of attention cues. If they're looking at something, you're gonna be apt to look at that something too.

And so, I think that's probably why magicians attempt to construct really accessible characters that the audience can understand and relate to, because it'll make them more easily influenced.

**Andy Luttrell:**
So, there's a longstanding history of magicians overlapping with skeptical movements, which has always struck me as curious. Not in that it surprises me, but it's like not all that often is there such overlap between two things that don't necessarily have to be related to each other.

**Anthony Barnhart:**
Sure.

**Andy Luttrell:**
So, from your vantage point, why would that make sense?

**Anthony Barnhart:**
I think training in magic makes you intimately aware of how fallible our memories and our perceptions can be and how easily influenced we can be by other people. So, Dan Simons has told me about when he constructed the invisible gorilla demonstration, and he thought in the very first iteration, he thought everybody's gonna see this thing. Everybody's gonna see it. And then literally nobody saw it. He had to over multiple iterations actually make the thing easier to see to get anybody to see it at all.

And so, I think our metacognition is pretty crappy, and experience in magic can at least boost up a couple pieces of metacognition: the fact that our senses are totally fallible, that they're driven by assumptions, and that our memories can be hacked so easily through simple suggestions that it allows magicians to see how hucksters are using these same strategies that magicians use for nefarious ends. So, I think magic could be a direct pathway to skepticism, toward having more intellectual humility to believe that… To understand that our beliefs aren't necessarily driven by the validity of our experiences in the world. I think that's probably why.

It's also probably because historically the skeptics movements have focused on debunking things like pseudo psychics that are using the same techniques that magicians are using, so it was a natural pairing there that just then fed forward into skeptics movements that broadened out.

**Andy Luttrell:**
Yeah, because it makes sense like in the classic story of Houdini and debunking mediums. You go, "Well, that's a case of here's a guy who knows how these tricks work." And then you're like, "Oh, you're just doing this? You're just doing the thing that I do? Hold on. What here?" But what's interesting is that that then spills forward into a way of thinking, a way of approaching to be like, "Wait a second. Just because someone says they're doing this, we don't have to believe it." Because we know people will say this, but do something else, and we know that it's hard for us to trust those experiences because I go, "Well, this feels like that was what happened to me, but I know enough to say maybe not. Maybe I missed something because of course I could have missed something."

**Anthony Barnhart:**
I could have missed something. And that's a hard realization to come to, right? The average person off the street thinks they're processing everything all the time. They're not aware of how much they're missing. But magic maybe increases your awareness of that.

**Andy Luttrell:**
It doesn't get you better, maybe.

**Anthony Barnhart:**
It doesn't get you better.

**Andy Luttrell:**
But at least you acknowledge.

**Anthony Barnhart:**
That's right.

**Andy Luttrell:**
I don't know everything.

**Anthony Barnhart:**
Yeah. Yeah. I'm sure you get this question a lot about heuristics and biases, like can we ever move past these? No, probably not. You can enhance your awareness that you might be using these biases but they're still automatic, right?

**Andy Luttrell:**
Yeah. The thing it reminds me of, I just taught this in… I teach a class on prejudice.

**Anthony Barnhart:**
Okay.

**Andy Luttrell:**
It's a similar kind of thing, of like how do we… If we have these knee jerk reactions that we built up over time for one reason or another toward other groups, is that just like a natural feature of our psychology, or can we do anything about it? And some of the work on it is like, "Well, what you

have to first do is know that you could fall prey to it," right? You have to be first aware like, "Oh, maybe I do have these patterns of biases." And then catch yourself in the act and go, "Ooh, oops. I just made an assumption about this person that now I so clearly realize that was misguided." But through that process you can go like, "Okay. Now I'm vigilant for these moments when the sort of natural tendencies might lead me to a conclusion that I don't want to reach or I don't think is a legitimate conclusion to reach," which is not all that different from saying I caught myself not seeing the coin.

**Anthony Barnhart:**
That's right.

**Andy Luttrell:**
In that APA video, did you do this trick with the cups and the coin?

**Anthony Barnhart:**
Yes.

**Andy Luttrell:**
I did not catch the coin.

**Anthony Barnhart:**
Oh, funny.

**Andy Luttrell:**
And until this moment when we're talking, it didn't occur to me that that was what happened. Maybe I just didn't see that part of the talk where you say this is what happened.

**Anthony Barnhart:**
I think I played it twice.

**Andy Luttrell:**
Okay. And I guess-

**Anthony Barnhart:**
And most people detect it the second time.

**Andy Luttrell:**
I didn't see it the second time.

**Anthony Barnhart:**
So, this is cute. Because anecdotally magicians are less apt to detect the coin than non-magicians.

**Andy Luttrell:**
Interesting.

**Anthony Barnhart:**
Because it's a friggin' weird method that I use, right?

**Andy Luttrell:**
Right. Even when you described it I was like, "I must be imagining this wrong."

**Anthony Barnhart:**
As soon as a magician covers up a coin with an object and then puts another object on the other side of the table, you know that the trick's gonna be.

**Andy Luttrell:**
Right.

**Anthony Barnhart:**
And you start activating all of these techniques that could be used to do it and all of them involve sleight of hand at the location where the coin's gonna vanish or sleight of hand at the location where the coin's gonna appear. They never involve the space in between those two locations. And so, I showed… When I first developed this, which by the way, I stole the technique from a magician. It's not my technique. A guy named David Regal. I adapted it from something he published. We had the very first conference on the interface of neuroscience and magic. It was in Spain. It was paid for by the Spanish government and it was like 10 magicians, 10 world famous magicians, 10 scientists, on this secluded island off the coast of Spain, spending a week together, and it was a weird experience. I was the only person who was both a scientist and a magician, and so that meant I didn't know which group I needed to cling to, but the magicians were like James Randi, and Jamy Ian Swiss, and Eric Mead, and all of the impressive Spanish magicians, and so I showed this video to all the magicians, and only one of them saw it. And it turned out to be the person that wrote the foreword to the book that this idea was published in.

**Andy Luttrell:**
That's funny. Yeah. I saw it and I was like, "How the hell is this happening?" It really… I was like… It caught me off guard because it was so much like a… You present it as like, "And of course, people's attention is in the wrong place or something." And I'm like, "But when is he gonna tell us what's going on here?"

**Anthony Barnhart:**
How funny. It's like almost 100% of people detect it on the second viewing.

**Andy Luttrell:**
Yeah. And I may also just have, speaking of attention, right?

**Anthony Barnhart:**
Divided attention. Yes.

**Andy Luttrell:**
There are other things going on, so maybe I was looking at other-

**Anthony Barnhart:**
Yeah. I'm sure. It was your kid.

**Andy Luttrell:**
But I definitely had a moment where I was just like, "What? It doesn't really make any sense." Because like you're saying, the functional fixedness thing, I do go straight to like, "Okay, well, is it like he's pulling it in? But no, it's not there. How did it… Maybe I could imagine how it ended up here, but how did it go away from over there?" And you're telling me it just slid across the table.

**Anthony Barnhart:**
It just moved on a little conveyor belt. Yeah. Yep.

**Andy Luttrell:**
Okay. Well, you got me. Okay, so this has been very fun. I think that is all that I have for you and this was great, so thanks for taking the time to talk about it.

**Anthony Barnhart:**
Thank you. This was a lot of fun.

**Andy Luttrell:**
Alrighty, thank you so much to Anthony Barnhart for sharing his work and what it means. You can find more about him at anthonybarnhart.com. He is also a founding member of the Science of Magic Association, which hosts a variety of neat events that bring scientists and magicians together. You can find links to that and the research we talked about at the webpage for this episode.

Also, big thank you to award-winning magician, Erik Tait, who you heard at the top of the show. You can watch his FISM act online—I'll link to it in the shownotes. I met Erik many years ago while doing standup comedy in grad school, and he's been a good friend ever since. For magic-minded listeners, Erik also hosts the Penguin Magic Podcast, which is very good.

As for me, you can go to OpinionSciencePodcast.com for everything you could ever dream of. Subscribe to the show, share with your friends, make your family listen to it while you drive to Christmas dinner. All of that would delight me.

And a couple weeks ago, I shared that I was opening up the chance to contribute financially to the podcast to help pay for all the things it takes to put on a good show like webhosting, licensing, transcription. I didn't know what to expect, and I was blown away to see people supporting the show, even within like a day of the episode going live. Truly, thank you to those who pitched in. I realized too late that I didn't set up a mechanism to automatically thank people when they contributed. That's on me. But let me just say, really, thank you.

If you want to pitch in too and help keep this show rolling, you can go to OpinionSciencePodcast.com/donate. It all goes directly to operating costs for the podcast.

Alrighty, it's holiday time. I don't know what you celebrate. For me, it's Christmas, so a very Merry Christmas to you all. Enjoy this time as much as you can, and I'll be back in 2023 with new episodes of Opinion Science. Buh bye…