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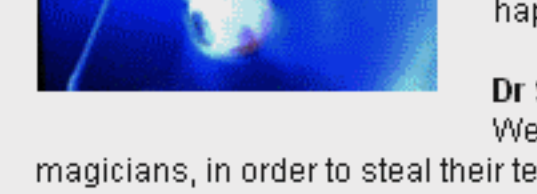
Neurologists in the USA are finding out exactly what's going on in our brain when we are deceived by a magician's trick.

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**MAGIC LAB** (06/05/2010)

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**TRANSCRIPT**



**NARRATION**  
 Las Vegas, it's the realm of magic a long way you'd think from the world of neuroscience. So what happens when these two universes collide?

**Dr Stephen Macknik**  
 We realised we really needed to talk to these magicians, in order to steal their techniques and take it back to the lab and use it for evil... no good!

**Dr Jonica Newby**  
 Well I hope you've got your eyes peeled and your wits about you, because what you're about to see will change the way you view the world. Welcome to the magic lab.

**NARRATION**  
 We begin our story with a magical tour and a visit to comedic master magician Mac King.

**Dr Jonica Newby**  
 I have no idea how he did that.

**NARRATION**  
 Before we reveal some of Mac's secrets and how he came to be mixed up with scientists, there's another master I've arranged to meet.

**Dr Jonica Newby**  
 Now, apparently this guy is a professional thief so I'd better be careful.

**NARRATION**  
 Apollo Robbins specialises in the obscure branch of magic that is pickpocketing. He has an almost supernatural sense of when to make his move known in the trade as "Grift" sense.

**Apollo Robbins**  
 Your watch doesn't come off very well, because it's a plastic diver's watch, but you used to wearing a gold necklace

**Dr Jonica Newby**  
 Yes.

**Apollo Robbins**  
 By retention, it feels like it's still there doesn't it.

**Dr Jonica Newby**  
 Of course it's still there.

**Apollo Robbins**  
 Would you like to double check?

**Dr Jonica Newby**  
 Which hand?

**Apollo Robbins**  
 This hand. Because it was fastened at the back how?

**Dr Jonica Newby**  
 By a clasp.

**Apollo Robbins**  
 By a clasp, hmm. You've watched me doing some stealing here while we've been playing with everybody else. At the same time, it's sometimes harder to feel things if you're not thinking about them.

**Dr Jonica Newby**  
 He got me. And I was looking for that.

**Apollo Robbins**  
 I know you were. I had to wait for the right time.

**NARRATION**  
 Some grift sense, I never felt a thing!

So there they were, Apollo and Mac, busy applying their hard earned magical skills when out of the blue in 2007, comes a call from a mysterious pair of scientists I'm off to meet now.

**Dr Jonica Newby**  
 This is Phoenix Arizona, home of the laboratory of illusions.

**NARRATION**  
 Here neurobiologists study how our brain and visual system interact to make us see.

**Dr Stephen Macknik**  
 The world is real. But, our perception of the world, everything that we've ever interacted with in the world is in fact an illusion, this grand simulation that's run by this amazing device called your brain.

**NARRATION**  
 Don't believe them? Well, try this but brace yourself, because this is weirder than a trip to Hogwarts.

**Dr Jonica Newby**  
 Imagine you are looking along a horizon. Say from that peak to that peak, your eyes move smoothly along it right? Are you sure?

**Dr Stephen Macknik**  
 In fact you can only move your eyes smoothly when you're actually tracking something that's actually moving smoothly. So I can follow my thumb like this and track it but if I have my two thumbs like this and I try to just move my eyes smoothly between them, I can't do it. I make these jumps called saccades.

**NARRATION**  
 State of the art eye trackers confirm this disconcerting truth. But it gets worse.

**Dr Jonica Newby**  
 But if my eyes are jumping, how come the world doesn't jump?

**Dr Stephen Macknik**  
 Because when your brain intentionally makes a saccade, it actually suppresses the visual system and that allows you to feel stability while your eyes move. When you make saccades which is about 20% of the time you're blind.

**Dr Jonica Newby**  
 No way!

**Dr Stephen Macknik**  
 That's right.

**NARRATION**  
 This news stunned me, so I tried a simple test they recommended.

**Dr Jonica Newby**  
 You can try this yourself at home after Catalyst has finished of course. Find a mirror and look from your left eye to your right eye and back. You never see your eyes move. You can see my eye's moving but I can't.

**NARRATION**  
 It's these startling gaps in our awareness that the scientists seek, to unravel how our brain simulates the world. But then they realised they weren't the only ones.

**Dr Stephen Macknik**  
 Magicians have been searching these out for a long time in order to apply them frivolously to bamboozlement and entertainment.

**NARRATION**  
 Perhaps magicians could open up a whole new line of research. And so it was that the scientists came to Vegas and met with Apollo whose "grift" sense had come up with something intriguing.

**Apollo Robbins**  
 I found that when I came out of someone's pocket in a half circle like this, they would chase this hand. It was almost like their eyes are watching a string like a cat does they had less of an interest in this hand. But if I went this way, their attention would snap back and they'd catch what I was doing with my hand. So after getting caught a couple of times, I evolved into the idea of how to manipulate that and use that to my advantage. So for me with stealing, I want more of a delay as long as I can just by this.

**Dr Stephen Macknik**  
 This was really exciting to us because he was saying not only are people blind during saccades, but that their attention is low during saccades which isn't known and that during pursuit eye movements, not only do you follow the curve, but your attention is stuck in a rut following the curve, which also wasn't known. And these things are very important to understanding how we see.

**NARRATION**  
 They'd stolen their first idea to take back to the lab with Apollo's enthusiastic support of course.

**Dr Jonica Newby**  
 Well, I'm about to become their very first guinea pig.

**Dr Susana Martinez-Conde**  
 Ready? So just observe the tricks normally while we track your eye movements. That's it.

**NARRATION**  
 24 hours of frantic calculation later, their pilot yields its first result.

**Dr Susana Martinez-Conde**  
 So let's take a look. That yellow dot is your eye position, and when he produced the curve motion, your eyes chase the motion trajectory just as Apollo had predicted. And what's interesting as well is that, after, you pursued with your eyes the curved motion, you went right to his face, you didn't go back to the original hand.

**Dr Jonica Newby**  
 Oh right.

**Dr Susana Martinez-Conde**  
 Which is still holding the coin. So you have kind of forgotten that the original hand is still involved in the manoeuvre.

**NARRATION**  
 Whereas on the straight move, my eyes did indeed snap back and forth.

**Dr Jonica Newby**  
 So it sounds like Apollo's grift sense was spot on.

**NARRATION**  
 It's a great start to the flow of ideas but could they flow the other way? Time to drop back in on Mac King.

**Mac King**  
 It's such a simple trick. All it is, is just one coin disappears before your very eyes. Sometimes you can see it disappear in mid air.

**Dr Stephen Macknik**  
 So this is an effect of inferred motion. In fact the coin never left his hand, nothing actually flew through the air at all, even though you see it. And so this is a very powerful effect. We realised that because we see motion better in the periphery of our vision that it would be even stronger if people were looking away. And he changed the trick right there.

**Mac King**  
 Right before I toss the coin I look up to draw people's attention to my face. So they see the coin in their peripheral vision which seems to enhance the magic

**NARRATION**  
 Which it brings us to our final trick and one of the fundamental laws of magic.

**NARRATION**  
 The truth is, it's not just the flaws in our vision that are being exploited, but in our brains.

**Dr Jonica Newby**  
 Want to know how he did it?

**Mac King**  
 So my right hand and my left hand apparently are just pulling up a rock out to give me easier access to my shoe. But my right hand is actually taking a rock out of my pocket. My left hand is grabbing the shoe so I shake and let this fig newton roll off the side and everybody watches that, that's misdirection. I direct attention to that, I look down and the rock just gets shoved into the shoe when I'm ready it appears in the shoe.

**Dr Jonica Newby**  
 It's amazing isn't it that no one sees this obvious object.

**Mac King**  
 You know, the first number of times I did this I'm like there's no way. But it turns out, it works.

**NARRATION**  
 And that's the most extraordinary thing about these master magicians they can do something right in front of you and you never see it.

**Dr Stephen Macknik**  
 Now magicians have long realised that attention has this aspect to it. That you have this spotlight of attention, you have this spotlight of vision, and the two spotlights don't have to be in the same position. And it's really a very exciting time because we're really starting to tease apart how exactly the circuits of the brain accomplish this amazing feat of attention.

**NARRATION**  
 It's very early days for the Magic Lab, but they're sure eventually to unleash some powerful forces.

**Dr Stephen Macknik**  
 We've just scratched the surface. We're not going to see the end to the neural magic collaboration in our lifetime I think.

**Mac King**  
 It's like the future.

Topics: [Health](#), [Others](#)

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