

# **BRAIN SCIENCE PODCAST**

*with*

*Ginger Campbell, MD*

[Episode #114](#)

**Eighth Annual Review**

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## **INTRODUCTION**

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This is Episode 114 of the *Brain Science Podcast*, and I'm your host Dr. Ginger Campbell. The goal of the *Brain Science Podcast* is to explore how recent discoveries in neuroscience are helping unravel how our brains make us who we are, and to make these discoveries accessible to listeners from all backgrounds. That's why I call it 'the show for everyone who has a brain.'

This our Eighth Annual Review episode, so I'm going to take just a few minutes to look back. On December 5, 2014, the *Brain Science Podcast* celebrated its eighth anniversary. To put that in perspective, podcasting officially began around November of 2004, and it first appeared in iTunes in July of 2005. This makes the *Brain Science Podcast* one of the longest-running podcasts in any genre, not just science or medicine.

And as many of you know, we passed 6,000,000 downloads a few months ago.

This includes downloads from 219 countries, including the Vatican. Since 60% of downloads still come from [iTunes](#), your reviews are still very important to helping new listeners find the show.

So, if you're new to the idea of a Review Episode, let me tell you what to expect:

First we're going to review some of the key ideas from all nine episodes. This will be pretty brief.

Then we will have some information intended to help new listeners get more out of the show, including information about how you can support my work. I will also take a brief look forward to what to expect in 2015.

At the end I'm going to announce how you can get a free book. I'm saving that for the end to encourage you to listen to the entire episode.

As usual, show notes, links, and episode transcripts will be available at [brainsciencepodcast.com](http://brainsciencepodcast.com). And you can send me feedback at [brainsciencepodcast@gmail.com](mailto:brainsciencepodcast@gmail.com).

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## DISCUSSION

First for just an overview of 2014, I interviewed 5 new guests, bringing the total of people who have been on the *Brain Science Podcast* to around 68. When I first started the *Brain Science Podcast*, I didn't do interviews. And then gradually these have become a bigger part of the show, because I really like allowing the scientists to share their work directly with you, so you can get a sense of their passion and a little bit of a better feel for what scientists are really like.

We began 2014 with the return of Dr. Michael Merzenich, who is one of the

pioneers of brain plasticity. Then we talked with Luiz Pessoa about the interaction between emotion and cognition. We talked with Dr. Penny Lewis about the science of sleep and Dr. Michael Graziano about consciousness. Then I did an episode that I called “The Hazards of Neuromania.”

After that, I interviewed my friend, Dr. Frank Amthor, about some of the basics of neurobiology. And we had the return of Dr. John Ratey, who talked about exercise and the brain. We also talked with Dr. Greg Hickok about mirror neurons. And we finished up with a special episode about neuroplasticity and healing with the Dalai Lama.

So, just to look at each episode for a few minutes and touch on some of the key ideas. We started the year with [Episode 105](#), which was, as I said, the return of [Dr. Michael Merzenich](#). We focused in this interview on his new book, [\*Soft-Wired: How the New Science of Brain Plasticity Can Change Your Life\*](#).

Dr. Merzenich is in his seventies, and this is his first book. So, I asked him why he finally wrote a book, and he said that he did it because he wants everyone to know that they can be in a better place.

To paraphrase him, he said he wants people to know that the brain is [plastic](#); which means we all have the power to make our brain stronger, better, more effective, and even more successful, not just next week but also next year. However, because the process of brain plasticity is two-way, we need to understand how it works and how our choices affect which way we drive this plasticity.

His book, *Soft-Wired*, contains many compelling stories about real people with a wide variety of challenges. But he is also very excited by the science, because it shows that all the processes that have been found to be associated with brain aging can be reversed. But this requires active effort on our parts; doing nothing

will lead to loss of function.

His overall tone is very optimistic. It's very sobering to think about how many of our daily habits contribute to our brain's downfall. Ruts and habits are bad for our brain. Our brain needs challenge and stimulation. It is geared to pay attention to change, which means we have to resist our natural tendency to avoid change.

Some people seem to be skeptical because they don't know Dr. Merzenich's long track record in doing ground-breaking science; which I think is one reason that he created a website for this book that contains detailed references. You can find a link for those references in the original show notes for this episode.

[Episode 106](#) was an interview with [Luiz Pessoa](#) from the University of Maryland. His book is called, [The Cognitive-Emotional Brain: From Interactions to Integration](#). Ever since the *Brain Science Podcast* started back in 2006, I have been interested in how the brain generates emotion and how essential emotion actually is to normal brain function.

I've never had the opportunity to interview [Dr. Antonio Damasio](#), but I did discuss his most recent book, [Self Comes to Mind: Constructing the Conscious Brain](#). I discussed that back in [Episode 90](#).

I've also featured the work of [Dr. Jaak Panksepp](#) several times, in [Episode 65](#) and [Episode 91](#). Dr. Panksepp's work is ground-breaking, because it has really shown that the origins of emotion are subcortical.

But getting back to Dr. Pessoa, his latest book is about the fact that emotion and cognition become intertwined at the [subcortical level](#) so that it's really impossible to think of them separately, and that instead of studying them as if they were separate, we need to study how they are integrated. The book contains sections about the [amygdala](#), motivational and emotional processing, and a broader

perspective on how the brain works.

In the interview, we focused on the amygdala and the [pulvinar nucleus](#) of the [thalamus](#). These are both subcortical structures. Key things to remember are that the amygdala does more than fear, and the thalamus is more than just a relay station.

This book is quite technical, and it contains detailed explanations of the evidence, but Dr. Pessoa did an excellent job in the interview of making his work accessible to all listeners. The bottom line is that emotional and cognitive processes are intertwined at every level in the brain. This is really important, because it means that we really shouldn't think of these things as opposing processes, but as processes that integrate.

So, if you sat down and said, *I'm going to think only logically, without any emotion involved*, this would really be impossible. If you were able to do it, you would have a hard time making decisions, because it's actually the emotional circuitry that helps us to know what matters to us, so that we can make choices.

As I said, that was a very technical episode, so [the next episode](#) was one aimed at everybody. It was an interview with [Dr. Penny Lewis](#) about her book, [The Secret World of Sleep](#). Dr. Lewis is a researcher in the United Kingdom, and she studies the relationship between memory and sleep.

Her book describes some of that research, but it also provides a good overview of the current science of sleep. We know that sleep is essential, but we still don't know exactly why.

Dr. Lewis and I talked some about the [stages of sleep](#). To me, stage 3, which is [slow wave sleep](#), is the most interesting. We touched briefly on sleep cycles, the role of sleep deprivation, and how both of these relate to memory. One interesting tidbit: caffeine actually does improve vigilance; but it stays in your

body longer than most people think, which means that it can actually disrupt sleep.

We talked briefly about the chemistry of sleep, and we talked about how slow wave sleep is important for memory consolidation. Dr. Lewis is very excited about research into how to increase slow wave sleep, because it tends to go down as we get older. I was surprised to learn that people can actually sleep in an [MRI](#) machine.

Next, in [Episode 108](#), I talked with [Dr. Michael Graziano](#) from Princeton University about his latest book, [Consciousness and the Social Brain](#). In this book, he presents what he calls the [attention schema theory of consciousness](#), which basically proposes that the same circuits that our brain uses to attribute awareness to others are used to model our own awareness.

Dr. Graziano argues that awareness is a form of perception. So, just as our brain creates a model of the world around us based on sensory and motor inputs, it also creates a model of the minds around us, including our own. This theory is yet to be tested, but preliminary evidence in its favor includes the fact that some parts of the brain that are involved in social thinking appear to also be involved in awareness. We know this because damage to these parts of the brain results in disorders of awareness.

One of the implications of thinking of awareness as a form of perception is that we know that perception is not necessarily accurate; it just gives us a quick and dirty model. When it comes to awareness, human beings do have a tendency to attribute awareness to almost everything around us. We do things like talk to our computer, even though we know that it can't really respond to us in an aware way.

But what I like about this theory is that, not only does it makes sense, but it also

explains why things like illusions are so powerful; for example, the feeling that our awareness is inside our head is extremely strong. Plus, as Dr. Graziano pointed out, it's a testable theory.

Thinking about consciousness as our brain's model of awareness also puts it within the realm of [information processing](#) and removes it from the realm of mysticism and magic. It also makes it something that other animals share along some sort of continuum, which fits what we are learning about non-human brains.

What about the difference between consciousness and awareness? Graziano said that he sees consciousness as awareness plus all the stuff you are aware of. We talked some about the implications of this theory, including Dr. Graziano's strong opinion that it should be possible to give this awareness to intelligent machines.

In the end, whether or not the attention schema theory of awareness stands up to further testing, it definitely moves us in the direction of making consciousness something that we can study scientifically.

[Episode 109](#) was called "Avoiding Neuromania." It was actually based on four books, including [Brainwashed: The Seductive Appeal of Mindless Neuroscience](#), by Sally Satel and [Scott Lilienfeld](#). Lilienfeld was on the *Brain Science Podcast* back in [Episode 70](#).

Anyway, neuromania, or neurocentrism, is the fallacy that neuroscience, or the study of the brain, is the only way to understand what it means to be human. As much as I love neuroscience, I know that it's not the only way to understand ourselves and others. That's why I have another show called [Books and Ideas](#).

But there are some important reasons why neuroscience isn't our only tool. First of all, often it represents the wrong level of analysis. Just as we wouldn't use [quantum mechanics](#) to understand our daily lives, a lot of what's going on in our

daily lives is not explained at the level of the brain.

For one thing, there is this tendency in neuroscience—or has been traditionally—to ignore [embodiment](#) and the influence of the environment. *Brainwashed* (which, by the way, is available from our sponsor [Audible.com](#)) provides a comprehensive overview of the key ideas of the problems with seeing the brain as the only way to understand the world. For one thing, they distinguish between the psychological and neurobiological dimensions.

I consider a few examples of neuromania in Episode 109. The most obvious is the problem of the misuse of imaging. First of all, as I have often emphasized, [correlation does not equal causation](#). So, just because a certain place lights up on an [fMRI](#) scan does not mean it's the place in the brain that causes the observed behavior or experience. And then there's the fact that brain scans are being used to support all kinds of pseudoscientific fads.

A concrete example of the other side of the coin is the example of [Dr. Edward Taub's](#) work. When he first started doing [constraint induced movement therapy](#), his results were ignored, because although he was having wonderful results with his patients, he didn't have any brain scan results that he could show. Which I think is a typical problem in medicine these days; we want to look at tests and technology instead of the person.

There are many excellent chapters in *Brainwashed*. The other one that I featured in Episode 109 was the one about the problems with the [brain disease model of addiction](#). This generated a lot of listener feedback, both positive and negative. One problem with the brain disease model of addiction is that it ignores psychological and environmental factors, which greatly influence whether a person has success or failure in recovering from addiction.

On a more practical level, it also results in lack of funding for programs that

work. If they don't fit this model of brain disease, then it's hard for them to get funding, even if they have a program that works. For example, programs that use incentives to help people to stay clean are out of favor because they don't fit into this brain disease model, even though they have good track records.

One reason I chose to focus on addiction was that reading *Brainwashed* made me aware that the data actually shows that three-fourths of people who are struggling with addiction in their teens and twenties are clean by middle age, but most of these people never enter formal treatment. So, they don't show up in the numbers that we usually see which are based on the people who keep going through rehab over, and over, and over.

This has been confirmed by several studies. And if you would like the references for this, I recommend the book, [\*Addiction: A Disorder of Choice\*](#), by Gene Heyman.

In Episode 109, I do go into some more detail about why these differing views on addiction are important. So, if this topic is one that you care about, I encourage you to go back and listen to the episode.

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In [Episode 110](#) I interviewed my friend, [Dr. Frank Amthor](#), the author of [\*Neuroscience for Dummies\*](#) and [\*Neurobiology for Dummies\*](#). This gave me a chance to go back to the basics for the first time in several years, but I tried to focus on ideas that would be useful to everyone.

We reviewed the structure and function of the [neuron](#) and considered the nature of [action potentials](#) and [neurotransmitters](#). If you consider that action potentials are [digital signals](#) and neurotransmitters provide [analog signals](#), this makes the brain the ultimate hybrid system. Of course, the [receptors](#) are really the key to

how the brain and nervous system function. There are hundreds of receptors, and in general they open [ion channels](#).

What's interesting is that for every neurotransmitter there are at least 10 to 15 different receptors; which means that the neurotransmitter will have different effects depending on which receptor it interacts with. This is really an important idea, because it means that it is an oversimplification to identify any neurotransmitter with a single action. For example, calling [dopamine](#) the 'reward chemical' is a gross oversimplification.

We spent a little extra time talking about the [NMDA receptors](#), which are thought to be important in memory. These are unique, because they act like an [AND gate](#). The NMDA receptor gate is usually blocked by a [magnesium](#) ion which can only be removed if an adjacent non-NMDA receptor gets activated by [glutamate](#), which then allows the NMDA receptor itself to be activated by another glutamate molecule.

So, that means two receptors have to be activated for anything to happen. Then, when it is activated, it actually triggers the flux of both [sodium](#) and [calcium](#). One reason we care about these receptors is that they are thought to be important in a lot of different things, including mediating [synaptic plasticity](#).

Of course, while I was talking with Dr. Amthor I asked him about the difference between brains and computers. He emphasized several ideas, including the fact that our brains are massively [parallel](#) and the fact that biological memory is reconstructive and dynamic. It's not anything like computer memory.

*Neurobiology for Dummies* has a very nice overview of brain anatomy. We touched on just a very few highlights. We talked about the structure of the [neocortex](#), which is the part of the brain that distinguishes mammalian brains from other vertebrates. And we also talked a little bit about the [cerebellum](#) and

the [spinal cord](#).

But of course, there's a lot of stuff in between, so I definitely encourage you to listen to Episode 110 and consider reading *Neurobiology for Dummies*. Even if you already know some basic neuroscience, this is actually quite a nice review.

[Episode 111](#) featured [Dr. John Ratey](#), the author of [Spark: The Revolutionary New Science of Exercise and the Brain](#). This is the first time I have ever re-posted an older episode. This was actually originally [Episode 33](#), which was one of my favorite early episodes.

I did also record a new interview with Dr. Ratey in 2014 about his new book, [Go Wild](#). This was featured in [Episode 55](#) of *Books and Ideas*, which I did put into the *Brain Science Podcast* feed—and I apologize to anyone who found that confusing. I realized that this was not a neuroscience book, which is why I made it an episode of *Books and Ideas*; but Dr. Ratey was a popular guest on the show, and I thought most listeners would enjoy hearing about his new book.

But in getting back to Episode 111, the key idea is that exercise really is our ultimate tool for stimulating brain plasticity and promoting brain health. This is something that I think we really need to share with smart people who think that exercise is not important to their mental health.

I also want to remind you that as a part of adding extra content to recent episodes in the [mobile app](#), you can get [Episode 45](#), which is Dr. Ratey's interview about [ADHD](#), as an extra for Episode 111. That's if you are using the mobile app.

[Episode 112](#) was an interview with [Dr. Gregory Hickok](#) from the University of California Irvine. He wrote a book called, [The Myth of Mirror Neurons](#). [Mirror neurons](#) refer to neurons that fire both when an action is performed and when the same action is observed.

They were first found in [motor areas](#) of the monkey brain, and then later found in the [parietal lobe](#), which is a sensory area. Most of the evidence for their presence in humans is indirect, although there has been at least one experiment with single cell recordings in humans where there are neurons that show mirror-neuron-like behavior.

First I want to emphasize that Dr. Hickok is not challenging the existence of mirror neurons—which you might think from the name of this book. What he is challenging is the most common theory about how they work, called the [action understanding theory](#); which is the idea that the role of mirror neurons is to help us, or monkeys, understand the actions of others.

Unfortunately, this intuitively-appealing theory was inspired by another theory called [the motor theory of speech perception](#), which actually had been abandoned by speech scientists because of overwhelming evidence that the ability to produce speech is not necessary to speech perception.

In Episode 112 we actually talked about the evidence against both the motor theory of speech perception and the evidence against the action understanding theory of mirror neurons. We did touch briefly on what they might actually be doing, but I will refer you back to the episode for that.

The story of mirror neurons is very fascinating. And in fact, Dr. Hickok mentioned when we were talking that, in doing research about this, he found it quite eye-opening, because it really sort of demonstrates the difference between how science works in theory and how it works in real life; that is to say that science is done by humans, and there are mistakes that humans make that don't fall under the scientific method.

The obvious mistake is remembering that correlation does not equal causation. A good theory makes testable predictions; and if your predictions failed, it's time to

consider your theory falsified. But, perhaps the most important thing that this story teaches us is that, if you're going to base a new theory on someone else's work, you really need to examine that original work with a critical eye, and even ask yourself *how can this be falsified*.

In the case of mirror neurons, this was not done. But the history of science is full of stories like this, which is, as I said, because science is done by human beings that are subject to the same cognitive biases and emotional tendencies that everyone else has. However, science does attempt to be self-correcting, and that is what sets it apart from many other human endeavors.

*The Myth of Mirror Neurons* really is a good book for readers of all backgrounds. But I want to remind you that my original episode about mirror neurons, which explored the early experiments in great detail, is available for free if you are using the mobile app. Just go to Episode 112 and look for the episode extras.

We finished off the year with [Episode 113](#), *Neuroplasticity and Healing*, which features [The Dalai Lama](#), Dr. Edward Taub, Dr. Michael Merzenich, and [Dr. Normal Doidge](#). For me, the personal highlight was listening to The Dalai Lama tell the story of his own intellectual journey. His love of science is fueled by natural curiosity. And as a boy, he took things apart—couldn't always put them back together. And he was lucky, because his love of science didn't get killed by taking science in school.

I wish we could figure out a way to fix this problem that we have in the West of taking kids' curiosity and then presenting science in school as if it is something fixed, instead of an ongoing process. I really admire those of you who are science teachers. We don't necessarily need more scientists, but we need citizens who appreciate the scientific method and the importance of making decisions based on evidence.

The Dalai Lama is a wonderful role model, because he has shown a willingness to let go of ancient [Buddhist cosmology](#) because it doesn't fit the evidence. As he said of modern [cosmology](#), the evidence is very convincing.

It was hard for me to be objective about the rest of the event, because I was so familiar with the work being presented. But the key points basically were brain plasticity is lifelong and it's two-way. Most importantly, it's never too late to tap into this brain plasticity; so everyone, no matter what their challenge, can benefit.

As I mentioned, Drs. Doidge, Taub, and Merzenich have all been on past episodes of the show. I have included Dr. Taub's interview from [Episode 28](#) as the mobile app extra for [Episode 113](#). And I included [Dr. Doidge's original interview](#) with Dr. Merzenich's [Episode 105](#).

The event, 'Neuroplasticity and Healing,' which was held at the University of Alabama at Birmingham, gave me an opportunity to invite both Dr. Taub and Dr. Doidge back onto the *Brain Science Podcast* in 2015.

However, my next guest is going to be [Dr. Evan Thompson](#), who was last interviewed in [Episode 89](#). He is going to be talking some more about the intersection between Eastern psychology and Western neuroscience. This was an important theme in Episode 113.

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Before we look ahead, I want to share a few more reflections about 2014. First, I want to thank each of you for listening, and for supporting the show, either with your [donations](#), [Premium Subscriptions](#), or probably most importantly of all, telling others to listen. I think 2014 was a pretty good year; looking back on the episodes, I am proud of all of them.

I want to mention that I did have several things that I did in 2014 that are

available on the Internet.

One is the talk I gave, [Why Neuroscience Matters](#), which I gave at [The Amazing Meeting](#) in 2014. That is available on YouTube.

I also did interviews for the [Stem Cell Podcast](#) and the [Prism Podcast](#). So, I will put links to this in the show notes.

I gave a talk to the undergraduate Neuroscience Society at UAB. That talk wasn't recorded, but I just mention it as a way of pointing out that I do like to do interviews and public speaking.

Of course, the big news for 2014, for me, was that I started a fellowship in [palliative care medicine](#) in July. Now, for those of you who aren't familiar with how medical training works, I want to just tell you a little bit more about what it means to do a fellowship.

A [fellowship](#) is specialty training that a physician does after they have already trained in their primary specialty. So for me, I graduated from [medical school](#) in 1984; and because I spent some time teaching [biomedical engineering](#), which interrupted my training, I didn't finish my family medicine [residency](#) until 1991. Since then, I have spent most of my time working in the [emergency room](#) in rural Alabama.

So, when I started this fellowship in palliative care medicine—'[hospice](#) and palliative care medicine' is actually the full name—when I started that in July, I was basically starting this fellowship 30 years after graduating from medical school. That's a little bit longer than people usually wait before they go back to do fellowship training.

I mention it because I was really inspired by all that I've learned in the last eight years about brain plasticity, and especially by Dr. Merzenich's book, *Soft-Wired*,

about the importance of continuing to challenge ourselves to push our brain's plasticity in the right direction.

And doing this fellowship has been very challenging. I have felt like I was up to it in terms of the mental challenge. The biggest problem has been time management, and the fact that I'm now working lots longer hours than I was before, so I don't have as much time to work on the *Brain Science Podcast* as I would like.

Enough about that. I want to just mention for those of you who are newer listeners how you can get older episodes, because I do get emails about this quite often. The most recent 25 episodes of the *Brain Science Podcast* are always free. But since, for example, we're now at Episode 114, that means that there is a pretty large back catalogue.

If you want to get an older episode, you have two options. You can sign up for the [Premium Subscription](#) for \$5.00 a month. That gives you access to all episodes and all episode transcripts. Or you can purchase [episodes](#) one at a time for \$1.00 apiece. [Transcripts](#) also cost \$1.00.

But one thing I wanted to announce is that, besides the most recent 25 episodes being free, I am also making all the previous Review Episodes free, and I am adding free content to the mobile app. So, for example, last month's episode I added Dr. Edward Taub's original interview as free content. For this month's episode, I will be including a free episode transcript.

And I guess I should remind you that I did, in 2012, publish a short eBook called [Are You Sure: The Unconscious Origins of Certainty](#). You can get that at [Amazon](#) for the Kindle, or if you want the PDF, just go to the *Brain Science Podcast* website and look for the link for the [store](#).

Obviously, the [Premium Subscription](#) is a key way that you can help to support

my work. I know that what some of you are doing is that you're subscribing, listening to all the back episodes, and then canceling your subscription.

Obviously that's okay, especially if you don't want to get any episode transcripts going forward. But if you can afford to keep subscribed, I really appreciate it, because the Premium Subscription has pretty much replaced donations as a way that listeners support the show. And it does motivate me to keep going.

Of course, if you do want to donate rather than subscribe, that's always okay. There's a big yellow [Donate](#) button the Home page of the *Brain Science Podcast* website.

There is also a [store](#) on the website, which is basically where you find the individual episodes and transcripts, and the PDF of *Are You Sure?* There's also a link there to the [Printfection site](#), which is where there is some really nice logo gear. So, if you like the *Brain Science Podcast* logo, and you want a shirt, or a coffee mug, or something like that, that's where you go.

I want to remind you that the *Brain Science Podcast* [mobile app](#) is now free. And that does give you some extra content, as well as an easy way to find and stream or download all the episodes. If you have the app and you want to get to your Premium content, you just need to go to Settings and log in.

I want to mention, with regard to the mobile app, since it's free for IOS, Android, and Windows, I really need you to post app reviews—especially for Android and Windows—to help people find this. Because some people who might not listen to podcasts might discover the show through the app.

Finally, I want to remind you that I do have a second podcast. It's called [Books and Ideas](#). It's mostly an interview show with a wide variety of guests, and all of the episodes and transcripts are free. And by the time you listen to this episode, the *Books and Ideas* app should also be free.

Looking toward the future, right now the only thing I know for sure that I'm doing in 2015, besides trying to continue the *Brain Science Podcast*, is I'm going to be speaking at the [American Humanist Association](#) meeting which is being held May 7-10 in Denver, Colorado. I don't know yet whether I'm going to go to the [Podcast Movement](#) in the summer.

I am hoping to continue putting the show out almost once a month—maybe semi-monthly, depending on what my schedule does in the next few months. As I mentioned, Dr. Taub and Dr. Doidge will be on the show, and I am expecting Evan Thompson to be the next guest on the show.

I would like to encourage all of you to visit the *Brain Science Podcast* website at [brainsciencepodcast.com](http://brainsciencepodcast.com). That's a place where you can leave me feedback; or you can send me email at [brainsciencepodcast@gmail.com](mailto:brainsciencepodcast@gmail.com). If you would like to interact with other listeners, we have a [Facebook fan page](#), a [Google+](#) page, and a [discussion forum](#) at Goodreads.

Right now, it is very hard for me to keep up with these social sites. I do have Twitter; I'm [@docartemis](#) at Twitter. Twitter is a great way to share new episodes with people, as is Facebook.

If you are someone who hangs out on Facebook, Google+, or even the Goodreads page, and you've got a little bit of extra time to help me with any of these pages, just drop me an email at [brainsciencepodcast@gmail.com](mailto:brainsciencepodcast@gmail.com).

Which reminds me, I don't want to forget to thank Lori Wolfson for her ongoing work with the transcripts. She does a fantastic job. And if you've never checked out one of her transcripts, you're really missing something, because she also always adds extra links.

So, if you want a free copy of one of the books that has been featured or will be featured on the *Brain Science Podcast*, all you have to do is send me an email

with “free *Brain Science Podcast* book” in the subject line. And you send it to [brainsciencepodcast@gmail.com](mailto:brainsciencepodcast@gmail.com).

I hope you have enjoyed listening to the *Brain Science Podcast* in 2014, and I look forward to talking with you again next year.

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The new theme music for the *Brain Science Podcast* is "Mind Fire" by Tony Cotraccia. You can find his work at [syncopationnow.com](http://syncopationnow.com).

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Transcribed by [Lori Wolfson](#)

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