



## Conscious Life presents

### Network Neuroscience and Memory

**Guest: Mark Waldman**

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#### **[00:00:09] Meagen Gibson**

Welcome to this interview. I'm Meagen Gibson, your conference co-host.

Today I'm speaking with Mark Waldman, author of 14 books, including the national bestseller, *How God Changes Your Brain*. He served on the faculty of Holmes Institute, and created the world's first Neuro Leadership lab course at Loyola Marymount University.

He, along with Andrew Newberg, are considered world leading experts on spirituality and the brain. He's just created the world's first twelve week trauma centered Neuro Coaching course based on the new field of Network Neuroscience. Mark Waldman, thank you so much for being with us today.

#### **Mark Waldman**

Wonderful to be here.

#### **Meagen Gibson**

Mark, I want to start by asking you, how are traumatic memories created? And where are they stored in our brain and body?

#### **Mark Waldman**

In order to answer this question simply, I want to start out with a statement that virtually everything that I thought I knew about the brain a few years ago, and virtually everything that you think you know about the brain is probably 99% wrong.

Beginning about five years ago, a brand new field of neuroscience burst onto the scene, it was called Network Neuroscience. We're all familiar with the ways in which we normally look at the ways different types of brain images are... In this part of the brain here's where your amygdala is over here, and your hippocampus, and your frontal lobe, and your occipital lobe.

**[00:01:43]**

None of those drawings are actually accurate. So a new technology originally emerged called Diffusion Tensor Imaging, and it creates a very, very different sense of what the brain actually looks like. What you are seeing here, these are the types of images that are produced, and what you are seeing Daniel Bassett called this a giant hairball.

You are seeing the mapping of the actual axons that run from your neurons that are on the outside of your brain here, and they cross all through the brain and connect with all these other networks. So that's your white matter.

Each color that's depicted in these represents a different function, we're no longer talking about structures, we're talking about how five key brain networks, your imagination network, your default network, your central executive network, your salience network, your emotional networks, how they're communicating with each other.

This is the field of Network Neuroscience. What has been discovered is that everything that we thought about what memories are also turns out not to be true. Memories are not something that's permanent. They cannot be stored in the body because it's based upon a certain type of protein molecule.

This is actually where your memory is stored, here's the tip of an axon, and here's the receiving part of the dendrite of the next neuron. This information comes down, and what's released into the synaptic cleft here are three or four different types of molecules. One of them is a memory protein molecule. One of them is a particular molecule to help stabilize that memory so you can recall it down the road if needed. But there's also a bunch of molecules in there designed to dissolve those memory proteins and to reabsorb them in.

What this means, and all of these proteins, and all of these memories that we have, our personal autobiographical memories. I'll show you just one more particular drawing here, in this big, huge yellow area here, this is your default network. Other people call it your imagination prediction network. I want you and everybody who's watching this take your fingers and put them right here above your eye.

This little tiny area, this is your dorsolateral prefrontal cortex. This is the only place that we have conscious awareness of what we are doing. Which means that all of our thinking processes, on all of the things we think we are feeling are going on in that huge yellow area, which is right here. If you put your hand on top of your head like that, here's your imagination.

In other words, "oh, my eyes open up. I wonder what I want to explore in the world that will bring me some pleasure, and some rewards, and some happiness, and some serenity." The dopamine that's released from our motivation center turns this huge imagination network on.

But if you stay up here too long, in other words, if you think about your thinking, you're wandering around in this daydream-like state. Because here hundreds of different thoughts and feelings are going on, and all it's doing is coming up with 100 different possibilities, literally every few seconds, or a few minutes, for you to decide, what is the best combination of all the things you can do, and shouldn't do? To do the next thing you're doing that work, to go forth and get the goal that you want.

**[00:05:45]**

Spending too much time in your imagination, in this world of uncertainty, maybe this, maybe that. There's another word for that, anxiety. All of the anxiety that we're feeling is actually part of our Imagination Network. Just knowing that new piece of neuroscience can make it incredibly wonderful to know that, "oh, all of the things that I'm worried about is just part of my imagination."

You can't get rid of it because your brain has to go back and forth every few seconds, between this huge yellow area here, and this conscious awareness doing center. Deep, deep down the side of the brain, there's another network that's represented by this green area in the drawing here, and that's your Salience Network. It's the part of your brain that decides what is the most valuable thing to pay attention to.

With all of these three things going on, optimal psychological health is defined as a rapid shifting between what I'm doing, and what I'm imagining I can do in the very next moment to achieve whatever goal I want. In this whole new network of brain science and network neuroscience, guess what? There's no place in your body or brain that keeps an accurate record of the past.

In this particular drawing here, in these synaptic clefts that are holding your sense of the things you've learned. Instead of thinking about memories, think about things that you've learned. If you go through a traumatic experience as a child, well it turns out that almost 99% of all children recover naturally from some of the most severe abuse.

This is the same thing in wartime situations, the number of people who have PTSD is less than 1%. And most of those individuals, over the next six months to maybe a couple of years, that PTSD goes away.

In fact, most recent research shows that first responders actually come away from being involved in these traumatic events with greater resilience, greater empathy towards others, and a deeper sense of life's purpose. This goes against this huge myth that's been building, particularly in the United States, that we are all walking around with unconscious memories of past traumatic events.

One is, there's no such thing as repressed memory, that was all pretty much thrown away in the early 1990s. Freud was completely wrong about all of this. The only neuroscience researcher who hung onto the notion that "memories are forever," I'm quoting him directly, is Bessel Van Der Kolk.

He was wrong about that particular part, the other thing that Van Der Kolk made very, very clear, and he'll get very, very angry if you go to one of his workshops, is that the title, *The Body Keeps Score*, this was the title that he had of his initial paper, he was not talking about the body. He was talking about how your amygdala and your hippocampus began to dysfunction when you went through severe forms of PTSD. He was studying World War II.

It's never been true that your body contains memories of any form whatsoever. Your imagination contains all of these little pieces of memory traces, little pieces of learnings, little pieces of remembrance, and that's what's going on in that synaptic cleft.

Maybe you have a thousand of these that's holding together an association of something that you had learned from the past that's related to that. Even the fact that you and I are looking at each

other right now, and the audience is looking at us, even in this moment you are not having exactly the same image of what it was when we first began this brief interview.

**[00:10:35]**

These memories are shifting and changing all the time, bits and pieces for one purpose only, and that's going back to that huge imagination network. It's only selecting information that will help you in what you are doing right now. Again, there's no such thing as the past as far as your brain is concerned.

Think about all the ways that this changes our current model of trauma, one is, and we're going to go back to this memory movement here. The more you deliberately try to recall a repressed memory that has never existed, the more you're creating an illusion of a memory. And by repeating it over and over and over again, you're strengthening that synaptic connection.

Now you have a problem, how do you get rid of the imaginary memory of a past traumatic event? There are three very simple strategies for dealing with that, and one is to watch that huge yellow area, that your imagination default network, and you sit back, and this was originally the whole purpose of mindfulness meditation. If you simply sit back and watch how your memory is going around. It might go, "oh, I feel tense, I feel stressed. I wonder what it's about. Is it the argument that I had with my wife this morning? Is it the fact that my dog was ill? Is it related to something from the past?"

That last statement, that is what society has embedded in us for the last 20 years, the notion that by understanding your past, it improves the way you are functioning in the present moment. And network neuroscience says all of that's wrong. The two key things that dissolve these memory traces that are in your imagination network is simply sitting back and watching how your imagination works, and then pulling yourself back into the present moment.

One of the fastest, easy ways to do this, because if you have too much busyness in your imagination, too much worry, too much anticipation, you get lost in this. And that overly active imagination default network is the central cause for virtually every psychological problem we have.

That Salience Network, that value network is designed to help you shift back and forth. Anytime you simply become aware of what's happening in the present moment, and aware of how your mind is wandering around, and all these creative problem-solving things, those two things create this rapid shift back and forth between your doing network, your imagination, and that is your neurological definition of optimal health.

I've overwhelmed you with a ton of information. Here's one of the things that's really cool, I'm going to teach you and everyone the fastest way to turn down too much busyness in that unconscious, semi-conscious mind. It's three mindful yawns, it's not just regular yawning. Because yawning increases the cerebral blood flow, which as far as this picture is behind me, is going to go up to the imagination network, as circulating blood flow cools down the heat being generated by overly active networks.

That's in a nutshell, in a couple of minutes the entire field of Network Neuroscience and how it relates to trauma. But if I was to ask you to say, "what did you remember from what I said?" All of us, you're only going to remember a little tiny bit, because this is the interesting thing about consciousness. You can only hold on to about two to four chunks of information for a few seconds,

just to help you get to the very next step of what you're doing, just to help me find the right word to say next.

**[00:14:58]**

Here's the best way to slow all of that down. I'm going to have you do it and everyone do this along with us. What I mean by a mindful yawn is to pay attention to where that yawn begins, what it feels like as you yawn, and feel free to stretch along with it. You're doing basically what every dog and cat do/does when they wake up. It's clearing that mind-wandering, daydreaming-like state.

Let's begin with that first mindful yawn. Everyone just close your eyes for a moment. I'll use the bell as a building device, and I'll explain how we use that to work with trauma and to bring yourself into the present moment.

Let's do our first mindful yawn and pay attention to what it feels like, and then pause for a few seconds. Then Meagen, all you have to do is share with me if you notice any shift in your mental state, or your mood.

**Meagen Gibson**

I'm more present, for sure. I'm a little bit more relaxed.

**Mark Waldman**

For a lot of people, the first thing they'll say is, "well, I feel more tingly," or "my body feels more relaxed." But again, guess what? Our body is part of our imagination center, it creates an image, a metaphor, a map of what's going on in your body. That's what we're paying attention to. A lot of people with their first mindful yawn feel nothing. That's why we're going to do number two.

Number two, a lot of people will say, "well, I feel tingly" or "I feel lighter." Again, referring back to the body. That's why I'm saying pay very close attention to your mental state, right now this should be very, very busy thinking about all the things I'm saying, trying to follow it, trying to make sense out of it.

With the second mindful yawn, you might become more aware of how your mental state and your mood changes. That's what I want you to focus on with this one. Let's do it together.

Just see what whisper comes to you. Do you notice any shift in your mental state or mood? If not, that's fine, we don't judge it. What do you notice this time?

**Meagen Gibson**

Well, what's funny is that by the time you'd asked me about my first yawn, I had already yawned three times. I think I just jumped the state. I was like, "I feel really present and really relaxed". And you were like "no." But in reflecting after the first yawn, I felt tingly in my head and in my chest. But by the time you asked me, I was already at my third yawn, because I'm an overachiever.

**Mark Waldman**

Let's do another mindful yawn and see what happens this time.

**[00:18:45]**

Now, for most people, it might even become hard to even find a word to speak. It's like, "oh, it takes too much energy." How about for you?

**Meagen Gibson**

Yeah, that's exactly what I was experiencing. This is the first time I've been like, "well, I'm just going to go, I'm going to go take a nap in the middle of an interview."

**Mark Waldman**

No, yawning wakes you up. That's why kids in my 08:00 a.m. college classes would be yawning a bunch, trying to stay, to pay attention. Yawning helps you to pay attention and focus to what you're doing, turns off that busy imagination anxiety world.

Sometimes, like you said, you started yawning more and more and more. That's simply your brain saying "there's too much mental stress going on right now." In Neuro Coaching and specifically with working with trauma, we're going to bring a person always back into the present moment, where there's hardly any thoughts going on. Then I'm going to ask you just to share, to use your awareness, and see what this imagination center whispers to you as an insight.

In this case, go ahead and close your eyes again, ask your intuition, that's part of your Saliency Network deep down inside, "what did your unique brain find to be the most interesting and valuable in anything that I've been jabbering about?" And share it with us.

**Meagen Gibson**

I think the thing that stuck out for me, and of course I don't remember exactly how you said it, is just that recalling memories, recalling experiences, they're never a factual representation of what actually happened, and don't help us build resiliency, or heal from difficult things.

**Mark Waldman**

Now one of the things you said that was interesting was, "I don't know if I can accurately say what you had said." That's the problem with our entire educational system. Young children live in that imagination network, and teachers are saying, "no, don't let your mind wander, don't gaze out at the window," which is such an important process throughout your entire life. You need to spend 50% of the time being in your imagination when you're awake.

Instead, we're taught to, "you remember what I'm saying to you, you write it down, and you repeat it." Well, that turns off your motivation network, that turns off your creativity, because guess what? Your creativity is part of your imagination network as well.

It doesn't matter what you remember from what I say. What matters is what does your unique, intuitive process, which stimulates that Saliency Network, which creates that optimal balance in these other networks, what did it find to be valuable? Oftentimes it'll have nothing to do with what I said at all. But that's what you should write down, because that's what you found intriguing. That's

what was curious to you. And that's what moves us not only into the present moment, but gives us a positive view of where we want to go next.

**[00:22:27]**

That's why you never have to go back and think about what happened in the past, because it didn't shape our behavior, most of us have resilience. Every time we recall something painful from the past, the purpose of the imagination center is to rearrange those molecules, and to rearrange the way those little synapses and axons are connecting in a way that's more productive.

So one more time, close your eyes, yawn, and stretch. Bring yourself back into the present moment. Where you're simply aware of the different sounds you hear. Don't try to make sense out of my words. Your mind might wander to pay attention to your breathing. Your mind might wander off to the weather. That's all fine. Just watch how your mind begins to wander. And those thoughts and feelings are going on 20 times faster than you and I could ever put into words.

It's really fun to share that mind-wandering process with a friend, or a colleague, and essential in the therapeutic realm as well. In doing that, where both the coach, and the therapist, and the client, are sharing their mind-wandering processes, you're teaching yourself not to get hung up in all of those worrisome thoughts that are going on in your imagination.

Again, notice how your mind is wandering all over the place. Let it wander, and ask your intuition again for a brand new insight. Let something brand new come into your awareness, that you never thought about before that might have meaning, and value, and purpose for you. And share it with me.

### **Meagen Gibson**

What my intuition wants me to ask you is that I know a lot of people with traumatic experiences often have trouble discerning between their anxiety and their intuition, and they can't tell which is which. Because their imagination brain, that's been so active trying to protect them, doesn't let that intuition through. I would love to hear your thoughts on that.

### **Mark Waldman**

One thing I want to make clear is that for most of us, when we think we've gone through trauma, we probably haven't, that's part of the urban myth. But for some of us, oh, no, there's no way, you can't turn off your mind from going and just, you walk into a social situation and you just cringe, because somebody there is going to be really inappropriate with you. Somebody out there is going to hurt you. That begins to move towards that diagnosis of PTSD.

PTSD has a very limited definition. It's where you lose control over your thinking processes, and they're going on whether you like them or not. They're waking you up in the middle of the night. That form of PTSD, if you don't use these new meta awareness strategies and mindfulness strategies to train yourself to come into the present moment.

What happens is that the myelin sheaths around those axons begin to break down, so you end up actually having structural damage. The communication between each of those different networks starts speeding up in misfiring and miscommunicating. And that takes a lot more work than for most of us who are simply wrestling with post-traumatic stress.

**[00:27:10]**

That's the beautiful thing about our brain, is that our imagination is always working to find a way to be fully present in the moment. To use that Salience Network, that intuition, to decide what it is that it really wants to do next? Not what the teacher told you, not what the therapist told you, not what your parents told you, but that unique intuition that was there even before you came out of the womb. It knows what it wants to do.

Young children, young mammals, they engage in rough and tumble play with each other, that playfulness, they're working out the social rules. Obviously if you go out in the world and the person you're playing with whacks you, you're going to stop playing.

Unfortunately, playing is the key emotional network, this is Panksepp's research. That playfulness releases the dopamine that turns on your imagination, that helps you to figure out that Salience Network on how to engage with another person in a way that's mutually pleasurable.

Anything that we can do to stimulate that Salience Network. 1. Is to slow down too much busyness, too much worrying going on. The other one is to watch all of that busyness going on. Yawning can really help a great deal, and we watch how that natural process is going on.

But then we pull ourselves back into the present moment, and just become aware, like right now take a moment and forget about everything I'm saying and savor the room around you. The different colors, I'm savoring right now, my imagination is going, "ooh, I love the shape of your microphone, and I really love that incredible smile that you're having right now."

So immerse ourselves in that, in the present moment, you as the interviewer forget about everything you were going to ask me. I, as the babbling neuroscience researcher, all that falls away, and I'm simply right here. Then if you and I simply both speak briefly, no more than 10 or 20 words, and pause, come back into the present moment. 1. The other person can only hang on to 10 words so you can remember that, back and forth, then we're creating mutual empathic rapport.

That combined with me sharing my mind-wandering with you, sharing my intuition with each other, pulling ourselves back into the present moment with a mindful yawn, or a super slow stretch. Or with trauma, sometimes when you're thinking about something that's upsetting, you have a soft object, and this is incredibly self-soothing. These are some of the key Neuro Coaching strategies.

Now I'm going to follow my own rule and speak 10 or 20 words and pause and let you guide us from here.

### **Meagen Gibson**

Absolutely. Thank you. I want to go back because you said something a long time ago about the molecules. I think it was memory stability, and dissolving molecules that cue. What cues those molecules and tells them what we're supposed to stabilize? What are we supposed to memorize? What are we supposed to dissolve? How does our brain decide?



### **[00:31:03] Mark Waldman**

We're coming back to what all of our brains are designed to do when our eyes open up, and that is to look around. What are you curious about exploring? That curiosity releases dopamine from the deep motivational centers in your brain. That motivation, that dopamine, moves up into your imagination network.

But if I learn something new from this, anything. If I learn how to savor the present moment, every new learned experience replaces an old learned memory trace. You have this thing that's bothering you, and all these molecules moving around, the new dopamine released from your curiosity as you learn something new. That could be as simple as just discovering what you and I are doing right now, like what's the most fun thing that's happening between you and I? For those of you who are watching, what's the most fun thing? What are you enjoying the most?

Don't try to remember what I'm saying, stay in that place of flow, that place of pleasure, that present moment experience, and that dopamine causes those protein molecules to move around and change. Your imagination center pulls up bits and pieces of memories that's useful for us right now, and that itself changes those molecules. It's always a slightly different memory.

Eric Kandel, who won the Nobel Prize for this research, said it very clearly, our memories are filled with confabulation, deletions, misconceptions, it's not about being accurate, it doesn't care.

As Joseph LeDoux, memory reconsolidation work for dealing with trauma, says, "you can never recall the same memory twice." But we're not aware of that.

Everything I'm sharing with you is probably brand-new information for everyone who's watching. I have put this all into a little ebook to make it easier to grasp on to these key principles.

They are changing all the time if our imagination does not use autobiographical memories. Other memories are different, movement memories can be pretty permanent, we habitually move, and that could be a problem down the road.

I see this, it's a mouse, I'm going to remember that, it doesn't matter if I'm seeing it in a different way or not, it associates to that. Those types of memories are always staying active because we're dealing with them in our present moment world, of what we want to do. If it doesn't recall those memories they decay.

In ten words... Dopamine, new learned experiences replace old learned feelings, and thoughts, and concerns that are not useful in the present moment.

This is all about present moment training, the ability to watch rather than engage in those thinking processes, all of our thoughts are part of imagination. It's one of the problems with cognitive therapy. They're asking you to think about your thinking. This new model from Network Neuroscience is saying, no become aware of how your thought processes are rambling around. It's about awareness, not about thinking.

### **Meagen Gibson**

For people who are new to you and your work, what can people expect from the ebook, and the trauma centered Neuro Coaching that you offer?

### **[00:35:34] Mark Waldman**

As you notice in this interview, I try to make everything as experiential as possible, because all of the words we choose, that's again our imagination deciding what to select, what to do in the present moment in communication.

In the book, and in a little tiny memory trauma and awareness challenge, I actually will walk you through once each day for about 10 minutes, what the experience of recalling a memory is like. What thinking actually feels like. How feelings have nothing to do with the emotional experiences that are happening in the present moment. And then how to become aware not only of the present moment, but the experience of being aware of awareness.

### **Meagen Gibson**

Fantastic. So Mark Waldman, if people want to know more about you in this process and the ebook, how can they do that? Where can they find out more about you?

### **Mark Waldman**

I'm going to presume that you're going to post the link of this rather long thing on the memory, trauma and awareness ebook. Just click on that link and you'll get that ebook.

I want you to specifically pass all of this information along, and in it all those pictures I was showing you can be simplified into this very wonderful drawing. That big default network, that's your imagination network. I made it big because we spend so much time there solving all of the problems moment by moment that's going on.

The purple area, our Central Executive Network, that's our doing network. And that blue area, deep down inside your Saliency Network, it's the last part of your brain to develop. It takes a good 30 to 40 years for it to fully come online. And that's why adolescents have such a poor sense of awareness of others. The Saliency Network is your social brain, it's what creates empathy and it also creates intuition.

It's the one part of the brain that all of our brain scan studies have shown that you can stimulate. You can turn on that blue area simply by observing your mind-wandering, sharing that mind-wandering process with a friend or a colleague, pulling yourself into the present moment for a few seconds, and asking for an intuitive insight.

Anytime you stimulate that Saliency Network, even for a few seconds, it creates an optimal balance between your imagination and doing network. That is again the definition, the neurological definition of psychological and emotional health.

The little ebook will help to explain what trauma is from this new perspective. Take a moment and enjoy those wonderful sneezes, see this is present moment experience. Now, normally in the past, when I would make these things, I would try to cut out that part or whatever else. No, this is what you're doing in the present moment. I don't have to have an opinion about it, I can join you, I wish I could make myself sneeze.

**[00:39:18] Meagen Gibson**

Yes, sorry for those of you who didn't see, I was off camera. I had a sneezing fit and hit the mute button while Mark was talking. He did a wonderful job of covering for me and just being with me in my sneezes.

Mark Waldman, thank you so much for being with us today.

**Mark Waldman**

My pleasure. And one more thing: download a mindfulness clock onto your cell phone, or your computer, and set it to ring three times an hour. And when you hear that bell, all you need to do is stop. Even if you're in the middle of work, in the middle of writing a paragraph for example, and take 10 seconds to yawn or stretch with full awareness, or focus on a deep inner value, and then throw yourself back into work.

That's what all of our research with executive MBA students at LMU discovered, that just doing this for four or five or six days, every single one of them, for 95%, stress levels went down, work performance went up, and no need to wander around in a past that doesn't hold repressed memories.

**Meagen Gibson**

Fantastic. Mark Waldman, thank you again.

**Mark Waldman**

My pleasure.