

Transcript of Cerebrum Podcast – Brain on Art: The Case for Neuroaesthetics

Guest: Susan Magsamen is the founder and executive director of the International Arts + Mind Lab, a pioneering neuroaesthetics initiative from the Brain Science Institute at Johns Hopkins University School of Medicine. Her body of work lies at the intersection of brain sciences and the arts—and how our unique response to aesthetic experiences can amplify human potential. Magsamen is the author of the Impact Thinking model, an evidence-based research approach to accelerate how we use the arts to solve problems in health, well-being, and learning. She is the co-editor of the American Psychological Association’s journal of *Psychology of Aesthetics, Creativity and the Arts* that will be published in 2020. In addition to her role at IAM Lab, she also serves as senior advisor to the Science of Learning Institute at Johns Hopkins University. Prior to founding IAM Lab, Magsamen worked in both the private and public sectors, developing social impact programs and products addressing all stages of life—from early childhood to aging adulthood. Magsamen created Curiosityville, an online personalized learning world, acquired by Houghton Mifflin Harcourt in 2014 and Curiosity Kits, a hands-on multi-sensory company, acquired by Torstar in 1995.

Host: Bill Glovin serves as editor of *Cerebrum* and as executive editor of the Dana Foundation. He was formerly senior editor of *Rutgers Magazine*, managing editor of *New Jersey Success*, editor of *New Jersey Business Magazine*, and a staff writer at *The Record* newspaper in Hackensack, NJ. Glovin has won 20 writing awards from the Society of Professional Journalists of New Jersey and the Council for Advancement and Support of Education. He has a B.A. in Journalism from George Washington University.

Bill Glovin: Hi, and welcome to the *Cerebrum* Podcast, where we explore topics about brain science. Today we are going to explore something called neuroaesthetics, a new and rapidly expanding field of brain science that combines elements of psychology, biology, and human evolution. Today's very special guest on the phone to talk about this new field is Susan Magsamen, the founder and executive director of the Arts and Mind Lab, a pioneering neuroprosthetics initiative from The Brain Science Institute at Johns Hopkins University School of Medicine. Susan is also the author of our most recent *Cerebrum* article, Your "[Brain on Art: The Case for Neuroaesthetics](#)." You can read Susan's article at dana.org. Susan studies and utilizes how music, art theater, dance, literature, landscape and media helps treat any number of neuro disorders and improves one's quality of life. Welcome to the podcast, Susan.

Susan Magsamen: Thanks for having me, Bill.

Bill Glovin: This is such an interesting topic I don't even know where to begin. Let's start with the word "neuroaesthetics." We all know about the neuro part, but why aesthetics, if we are talking about how the arts impact the brain?

Susan Magsamen: So neuroaesthetics is really a great word. When I first use it, people kind of scratch their head and they don't know where to go with it, but you know, aesthetics means different things to different people. The artist thinks about the quality of something. Oftentimes, curators will think about the value of an aesthetic. Do they have a good aesthetic or a bad aesthetic? What we think about when we're talking about aesthetics in neuroaesthetics is the way that sensory systems bring in information from the world and how that is converted into perception. And so how do we perceive the world? What are those aesthetic experiences?

And we don't try to quantify them or judge them. What we're really looking at is trying to understand what they are, how they are encoded in the brain, and as it turns out, fortunately while the mechanisms are the same mechanisms based on conditioning, genetics, environment, culture, aesthetic experiences happen to be different for each of us, so what resonates for us is different. So we're really interested in getting at a deeper understanding of sensory integration and how that translates into what we call aesthetic experience. And while everything is aesthetic, not everything elevates to the level of a transcendent aesthetic experience where you really have some kind of profound biological change. And so some of our work looks at some of those deeply moving aesthetic experiences that significantly impact the body and the brain and the mind.

Bill Glovin: Well, let's go back to your beginning. What made you interested in this type of work in the first place?

Susan Magsamen: You know, it's a couple of things. One is I have always been deeply curious about the way we move in the world and the way people have different points of view and different perceptions. I was born in a big family of lots of different kinds of ideas and perspectives, and so interdisciplinary work has always been really interesting to me. I really love understanding different points of view, and this neuroaesthetics field totally calls for this ability to be able to listen and hear very different points of view around the same topic.

Susan Magsamen: In terms of the sensory piece, I think I have always really been moved by place and environment. And I would say mostly as a child, in nature, I was very interested in the way the wind blew or the smell of grass, thinking about light and sound, and that ultimately grew for me to be very interested in the way people express themselves by making things, and often that's in an artistic way, whether that's dance or film or creative writing or poetry. So that way that we take these sensory inputs and we turn them into voice, into message, and into the ways that we communicate about ourselves was always super interesting to me, and marrying that to the neurobiology of how we learn and the neurobiology of emotion as I sort of moved into undergraduate and then graduate work.

So I've always been really fascinated with this approach to how we create spaces, and the sensory inputs around that, and how we share our voice. So in

neuroaesthetics, we look at both the making of experience, the making of aesthetic experience, and also the beholding of aesthetic experiences, which have some commonality, but they also have differences.

Bill Glovin: I noted in your bio that you worked in the private and public sector before coming to Hopkins, and prior to founding the Arts and Minds Lab at Hopkins, you created something called Curiosityville. Can you tell us what that is?

Susan Magsamen: So Curiosityville is an online learning world for young children three to eight years old and their families, and it was built on a platform using algorithms, that sort of initial AI thinking, to help children scaffold through 10 learning areas. So, from executive function and social emotional learning to sort of core curriculum areas like mathematics and reading, social sciences, technology, and really being very mindful of helping children to begin building their core skillsets at an appropriate level, and then providing them lots of different opportunities to do that in very immersive, multisensory ways. So it was built as an online learning world with also a very large sort of analog to hands on learning.

And that word, Curiosityville, came out of a company that I had started before that called Curiosity Kits, and Curiosity Kits was something that I started in 1988, and it was a hands on learning company working in arts, sciences, and world cultures, and helping kids have these very tactile, multisensory experiences to explore another culture, or to understand some kind of scientific method or concept, or to just explore creativity and innovation and art making, and skill development in those domains. I worked with National Geographic and Scholastic, Discovery Channel, a lot of educational publishers and organizations that disseminated these kinds of materials into classrooms, but also in out-of-school learning environments, community centers and museums, libraries, and then also at home.

Susan Magsamen: So I've always been really interested in this multisensory way that we learn that augments and compliments traditional reading to learn, which is really what mostly happens in classrooms. And all of that work, while it was in the public sector, was interesting because this sort of public-private partnership work, I've always been really interested in the science behind learning, or the science behind aesthetics. So neuroeducation, neuroarts, neuroaesthetics, really marrying these disciplines at their purest form. And of course, the neurobiology is really important, but so is the sociology and the psychology and the anthropology and the evolutionary biology around all of these things, so pulling all that together. So, Curiosityville and also Curiosity Kits really looked deeply using different modalities of how we learn and how we bring new knowledge and integrate that into our beings.

Bill Glovin: I couldn't help but notice that you've founded and direct the center at Hopkins without a Ph.D. or an M.D. degree. How does one go about doing that? That seems like quite a leap.

Susan Magsamen: I love this question. I think that life experiences are undervalued in the academic community in general, and I think you often have to have that credentialing to even walk in a door, and I think that limits a lot of amazing thinkers and amazing experiences that we may have outside of a rigorous academic training, which I think is obviously super important. I've been a lifelong learner, and I've always been really interested in understanding the science behind these fields, so I think of myself more as a creative and an educator that uses science to translate into practice, so I've always sort of been at that practice, that intersection, that liminal space between the research and the practice.

You know, Hopkins is a unique place. I've always been welcomed and appreciated for the skillsets that I brought to an academic community, and so it's never been difficult to have dialogue and think about how we might marry unique skillsets to sort of move a field forward, and I don't know that Hopkins is unique to that, but in my experience, they've been an innovator in allowing knowledge to come from lots of different places, and not only with a Ph.D. or an M.D.

I am highly collaborative and I'm also a learner, and I'm curious, right? So I think those were criteria for being in a rigorous environment where you're trying to advance fields. So my path has been sort of a glorious switchback and lots of zig-zags in terms of moving toward how you can use the arts to enhance health and wellbeing and learning. And I feel like I'm continuing to learn, so I probably have a Ph.D. in curiosity.

Bill Glovin: Interesting. Your article traces the evolution of the arts, and even goes so far as to say that one philosopher claimed that the arts are encoded in our genes. You also write that the arts have had considerable healing power throughout history in different cultures, yet it's only in the last 15 years that scientific research has finally caught up to the notion that the arts are something we can't afford to live without. If it's so obvious that the arts have the potential to help people overcome all kinds of problems, why only in the last 15 years has the field began to take shape?

Susan Magsamen: The arts have been with us since the beginning of humanity, and if you look throughout documented history, you see very clearly the role of the arts in terms of dancing around a fire, or storytelling, the way song has been used to think about grief or loss or celebration. The human expression, which I think are the arts and the humanities, use of those have been critically important along our path for communications, for connection, for survival, for building societies and cultures and rituals and traditions, and all of the things that we know to be true. We even know that Hippocrates looked at light and noticed very early, 2000 years ago, that the absence of light predicted disease. So, when you think about these aesthetic sensory experiences that affect how we move through the world or how environments are shaped, we've been thinking and talking about those since the beginning of humankind.

I think the age of reason put a stop to all of that. When we had to justify and show empirical data to prove something that we intuitively believed was true, we shut down a whole way of being for humanity. And in many ways, I think we're still recovering from that. We've become data-driven, very empirical, a set of scientific methods that have been very helpful in developing medical technologies and discoveries, but at the same time, limited this entire field of neuroaesthetics and the arts, that could be a partner in helping to relieve pain and suffering to create greater wellbeing. Think about, I say, transcendence versus transaction. We're a very transactional world, especially as the world has continued to connect through technology. How do we think about what it means to be human, and what does wellbeing really look like?

Another aspect of that, I think, is commerce and the economic return on the arts. I think traditionally we haven't thought of it as an industry, and I don't mean performing arts or the professional artist, but the healing artist, the teaching artist. The economy there has not been well documented. We have more information when we look at return on investment in things like early learning and in commitment into early learning programs for three and four year olds, or family engagement. But in this art domain, which is just emerging, the NEA just recently created a report around the arts economy, and this was separate from the deeper understandings around arts and medicine, or arts and learning, or arts and wellbeing. This was more looking at arts and sort of general professions and has clearly been able to show that the arts contribute more to the economy than other sectors, and that we really hadn't begun to think about it.

Susan Magsamen:

So pharmaceutical companies are not interested in developing arts interventions. How do you monetize? It's very hard even now to get compensation for art therapists from healthcare providers. So the policies and the practices have not really come in sync at this point. I think the work that we're doing now where we are showing these quantitative and qualitative, but quantitative measurements around different arts experiences related to disease models and to mental health models and to wellbeing and to learning, is beginning to show. And some of this is the technology is now there, right? You have imaging. You have mobile imaging. You have biomarkers that you can measure. And the arts, I think, are mobile by design, so you can't put somebody in an MRI machine and really get the impact and the granularity, and I think the real nuances of what's happening with an arts intervention versus a pharmaceutical intervention or versus some other kind of intervention.

So I think we're starting to be able to think about this as a field that has a financial model. Up until several years ago, it was very hard to get funding for arts research in scientific funding. Just this year, Francis Collins, in I think infinite wisdom, has put \$5 million on the table for sound healing, and that's really part of a complementary and integrative health cohort that's looking at how the arts and aesthetic experiences can weave together with technology and basic science to think about the continuum of care and the quality of life for people that have a number of different disorders, from Parkinson's and Alzheimer's to

depression. We're looking at a lot of different kinds of health areas where I think this is going to be more valuable. So I think it's a complicated story that is now starting to come together as we're seeing these fields stronger together.

Bill Glovin: Are there mentors for you? Because if this is just 15 years old, were there a few people who basically took the reins and ran with the idea that this is kind of a substantial and an important area that has been overlooked?

Susan Magsamen: Like many fields of science, this has been a very siloed, bifurcated field. I've been doing a project looking at mapping the ecosystem of neuroaesthetics, and it's everywhere and nowhere. It depends upon how you enter it. Obviously I mentioned the philosophers had been thinking about this for a long time, but Semir Zeki is really the person that's noted for coining the term neuroaesthetics. He's at the University College of London, and he's been more interested in looking at neural basis underlying perception and visual perception primarily, although he's been studying some other things including the neurobiology of love.

There have been others that have been doing work. Jean Pierre Trudeau, Ramachandran, Charles Lim has been doing some work in creativity. Robert Zatorre has been doing quite a bit of work since the 80s in music and sound. I think Antonio DiMasi has done some really great work in looking at creativity, but also looking at the arts and academic outcomes in math and language and literacy and social emotional learning among other things, so there's been pockets of people doing things all over the world. Max Planck has an aesthetics cohort and they're doing some really interesting work in default mode network, for example, and also visual processing.

Susan Magsamen: In the practice side of it, there are many people using arts integrated experiences in museum settings for different issues including Alzheimer's and dementia. Seeing refugee and immigration support using the arts for trauma, which is a huge issue. It's an area that is critically important in this country, with what's happening at the border, but also in other countries where the Syrian refugee population is just chronically traumatized, and in other traumas too, including domestic violence and things like that. So there's a lot of things happening, and what we've been doing is trying to look at that at large. Internationally, really sort of look at field, and sort of see, "Who's doing what? Research is happening in what domains and what art forms? What's the methodologies that are being used? What's the science look like?" And then also, "What's the training look like?"

There are currently no opportunities for undergraduate or graduate neuroaesthetics degrees. You can get a neurology degree, you can get a neuroscience degree, you can get a cognitive neuroscience degree, you can get a psychology degree, and you can be interested in this field. And so we're really trying to right now catalog what's happening. For the practitioner, there are therapeutic arts certifications in different states, and in the creative arts therapies like music and dance and drama, creative writing, there are advanced

degrees up through Ph.D.'s where you can get training in the marriage of an art. For the most part, it tends to be more around psychology and thinking about mental health using the arts, although that is broadening and we're looking at more physical health kinds of interventions. So the field is very fragmented, and part of our lab's perspective is to try to think about sort of showing what it is, and then where are the gaps in terms of, "How do you build this as a field?" You think about neuroscience is not that old. Neurosciences was started in the 70s, so if you're building a field, what does it take to build a field?

As far as mentors, I feel like there's so many, and this kind of harkens back to this idea of interdisciplinary. I think that the people that work in the field from research to practice are extraordinary, they're curious, they're interested, they're rigorous. It's an amazing field, so I sort of move between the researchers and the practitioners with that intersection of translation and also scaling and dissemination. Because in this field, because there's not a lot of funding, it's even if you have a great intervention, it's really hard to scale and create a sustainable program.

So, some of my exemplars and role models in that side of the field are the Mark Morris Dance and Parkinson's Program who have been very successful in scaling a dance intervention for Parkinson's. Save the Children has a fantastic program for working with refugees, it's called Heart. Those are two really, I think, great examples. University of Florida, Gainesville has a wonderful arts and medicine program, and a certificate program. It's not neuroaesthetics. It's not all around the neurobiology, but it's about the practice of creating arts and medicine programs.

Bill Glovin: You mentioned before biomarkers, and you write in the article that scientists can now identify biomarkers, and that helps measure ways to characterize changes in the brain, and they also use sensors to measure the experience creating art. How is this information used?

Susan Magsamen: It's very context specific, and I think one of the places that the field is at right now is trying to look at these different methodologies, these research techniques, to see if we can understand what the translation of that data is to better understanding how the brain responds to different art experiences. So I'll give you a couple of examples. We have a project in our impact thinking model where we're looking at the role of tailored activities for people that have dementia but also have a great deal of aggression and frustration. And so the hypothesis, and this is working with Laura Gatlin's tailored activity program, that when someone is doing an activity that they have immediate autobiographical response to, or they're able to engage, they're able to attend, and doing that activity in a number of sessions or looking at dosage over a 12 week period will reduce cortisol, and reducing cortisol will reduce frustration and anxiety.

And that's a really important finding to understand. So for that population, we're doing a very simple cortisol swab pre and post, to be able to see if we can see measurable differences in cortisol. And this intervention is known to be very

effective anecdotally, but what we're trying to understand is, what is the mechanism that's really driving this change? And then can we amplify that? We're also looking right now at using fNIRS for a virtual reality project that we're doing with Drexel University, and this is the first in a number of studies where we're using the Google Tilt paintbrush, where we're asking people to have guided creative experiences using the Tilt and also open-ended experiences using Tilt. And with that, we're really trying to understand what is changing in the brain when there is prompted guided experiences versus open-ended. And we think that can be ultimately important, using virtual reality in different kinds of interventions for different disease states.

There are several projects that are using virtual reality for pain, for example, and it's unclear yet why it's effective. Is it because it's actually changing a pain mechanism, or is it really distraction that's the underlying mechanism for the reduction, or the perception of reduction in pain? And so we're really interested in understanding the role of technology in health and wellbeing, and ultimately in learning and immersive experience, and what's happening in the brains, and this Drexel project is just starting to look at that.

Susan Magsamen: Neuroscientists say this all the time. We know very little about how the brain works, and so in no way is the neuroaesthetics community hubris enough to say, "We think we can really understand the incredible complexity of music on the brain today." But what we're trying to do is put some tools in the field, and rigorous scientific methods, to be able to begin to put those things together in using an arts-based scientific method, and that's what this impact thinking model is really trying to do.

Susan Magsamen: So sometimes we use qualitative tools, and so an example of that that's I think super interesting is, we're doing a project right now with Baltimore City, who has been trying to address gun violence in youth in the city, and they're doing it through using process of bibliotherapy, so reading literature, and then opening that up to creative expression and self-expression, and then being able to really try to measure what's happening, what changes are happening in terms of information and attitude and behavior. So not everything has to be biomarker driven or imaging driven, but we're trying to create a toolbox of tools that help to explain and understand, and amplify the changes that are happening on a biological level that may help inform how these art experiences get used, and not only get used, best practices for what they are.

Bill Glovin: Right. So I guess the reward systems and default mode network kind of fit into exactly what you're saying in terms of the biology of things. But your article mentions the work of Robert Zatorre, and you mentioned him already. He's a cognitive neuroscientist at McGill University in Montreal who studies the impact of music on the brain, and Dr. Zatorre wrote an article for *Cerebrum* and did a podcast with us in December. And when you talk about the arts, there are really a wide range of areas besides music. There's art, there's theater, dance, literature, landscape, and media, as you define it. Does each area have a different impact on neuroaesthetics?

Susan Magsamen:

I would say framing it that way, no. I think that the nuanced response is that we know that these different sensory inputs do different things. We know they work differently. How light impacts the eye, and ultimately the brain works differently than the way sound enters the brain. So the sensory inputs do different things and they engage different parts of the brain. When you look at the arts and how the arts really use all of the brain, they engage the limbic system depending on what's elevated, they engage the visual system, they engage the Broca system, they engage the hippocampus, they engage the amygdala, they engage the default mode network. You talk about reward, and pleasure, or fear. And so what's so fascinating about the arts is they engage different systems to create these networks, and these networks are so informed by, as I mentioned earlier, around conditioning and genetics, and the way that we've been raised, our experiences, and how those very unique experiences shape who we are.

So when I listen to a piece of music, I may say it's beautiful and you may say it's beautiful, but we may be saying it's beautiful for different reasons, although there may be some commonality around things that we like about it, but it's going to be informed by our experiences and who we are, and different kinds of music elicit different kinds of responses at large. So I feel like the way we've come at this, and I think at this moment it seems to be holding true, is that there are some neuroaesthetic principles. Dr. Ramachandran has put out eight principles around visual perception. Anjan Chatterjee has a kind of neuroaesthetics model I would consider to be a principle around this triad of sensation, emotion and meaning, and how we understand the world, and I think these principles around neuroaesthetics are really important, because they start to give us kind of places to locate, like the default mode network. Really understanding how that plays out is super important. How reward ties into something. How fear conditioning works, and how that may shut the Broca system if you've really had a traumatic injury or a traumatic stressful experience.

Susan Magsamen:

I think all these principles are super important for us to really understand, but what we've done in our lab is said, "Let's use kind of an inside-out approach. Let's look at solving, addressing a specific problem through the lens of an art form." So we just did a project on guitar PD, where we were looking at quality of life measures for Parkinson's patients, and we weren't trying to boil the ocean. What we were trying to see was, what changed when a Parkinson's patient had a 12-week experience learning how to play guitar, when they never played guitar before? What changed? And what we saw was that there was a significant change in their mood, and that seemed to have some influence on their cognition.

And this is against a normed Parkinson scale, and so in that context, for each of these folks, what we saw, there was a shift in how they felt, and that's really important when you're in a disease state that tends to also elicit more depression, more despair. And there was a halo effect there, which we didn't expect and we didn't study it, but we observed it and collected some data

around it, was that the caregivers also felt more hopeful, and that is pretty important when you have a chronic disease, that's a degenerative chronic disease. And so we know that we want to look at that more deeply and try to kind of dig into that a little bit more, but that was sort of an initial touchpoint in looking at this work around guitar.

Another project that we're doing right now is looking at developing a room for children with disorders of consciousness that has lots of sensory inputs, that we can actually personalize the sensory inputs, and our idea is that we think we can help children wake up faster and better. And part of this is around sleep, so we're trying to be very targeted to what the sensory experiences, the aesthetic experiences, or the art intervention can do and what biological mechanisms it might be affecting. So I feel like over time we may be able to say, I don't think it's going to be prescriptive, like, "Draw two paintings and call me in the morning." But I do think that we're going to start to have some understanding of the motor system, the reward systems, the way the default mode network works against different kinds of health and wellbeing and learning problems that we're trying to solve for.

Bill Glovin: Can you elaborate a little bit more on what you mean in terms of landscape and media and how they fit into the definition?

Susan Magsamen: Well, media is just so extremely interesting. There's media, meaning traditional film or television, and you think about the social implications and the change that they create through inference, and just how we get so much information from media, and even on our handheld media, whether it's YouTube or other things. The other area that we've been really interested in is digital media and immersive VR, and even augmented reality, and really looking at, what is the same and what is different in those environments, from analog to digital? And what are the opportunities using these kinds of advances to really help address some of the issues that are really important? As I mentioned, pain, earlier, but also depression, stress, anxiety. What are some of these digital tools that may really be able to help us understand consciousness and unconsciousness? What comes out in these forms that are so immersive? So that's super interesting.

And then in terms of landscape and environment, creative place making, what our environments look like and feel like, really allow us to grow and change, and be in the world. So one example is in urban environments, where there's such under-resourced communities, where the space that people are living in, they're unsafe. They may not have proper lighting or any lighting. They may not have temperature control. These are all aesthetic things that change the way our body can sleep or not sleep, or, "What's the light look like? What's the temperature? Texture?" Thinking about creative place making, how do you create a space where safety, number one, but then the ability to take risks and think about identity, to be able to build skills, is super important. So that's kind of added societal usability of space. But we know a lot about nature, and we know a lot about the way nature really changes biology, and lowers blood

pressure, and lowers cortisol levels, and provides a whole different sense of healing.

So, I think landscape also, thinking about, "What are the landscapes where you are?" We're indoors 80 percent of the time now, whereas humans we were outdoors 90 percent of the time. And so what do these shifts in space mean for us? And what does that mean for lighting, and what does that mean for sound, and for smell, and for all the sensory inputs that we have? So I think landscape and environment, "How do you build a park? How do you build a new housing community? How do you think about the way we interact with each other in space?" Simple example is strip malls to these kind of towns in the middle of parking lots, and how that's changed what people think about as a community.

Bill Glavin: You talked a little bit before about the struggle for recognition for neuroaesthetics. Do you see more students interested? Do you see more neuroscientists conducting studies that link the arts and the brain? How is the field growing? Is it growing fast enough for you?

Susan Magsamen: It's exploding. It's just exploding, and if I think where our lab is pretty small, and we're part of the Brain Science Institute at the School of Medicine down in Hopkins, so we have an ability to be able to expand to meet need. We've been very careful to be strategic about how we grow, but what we find is there's just a huge interest from many stakeholders, whether it's a researcher, practitioner, students. I think it's the young people's field. I think that you're going to see undergraduates and graduate students, and we're seeing it gravitate to, "How do they learn more about neuroaesthetics? How do they bring this forward?" And it could be an architecture student. It could be an art student. It could be a neurology student, neuroscience student. I have OTs that are interested in the work, so I think it's just exploding and it's super exciting.

This consensus framework that we've developed, this impact thinking model, we think that's really important for growing the field, because it provides an anchor and a way to look at research and practice together in a highly interdisciplinary and very dynamic world, so we're really committed to sharing that and building that. We're also really committed to looking at education, and, "How do you train people that are interested in this field?" Because it's not a clear path. There's really no journal for neuroaesthetics at this point. There's some places where you can do some cross publishing, but I think really the field is just, it's so ripe, and I think that in part that's because the technologies for looking at what's happening in the brain, and looking at biomarkers, and our ability to be interdisciplinary, I mean, that term has come up a lot for the last 10 years, but I think we now know more what that means and how to do it in a way that we haven't. This idea of collective discovery, and shared bringing people together, that when you bring them together, parts are greater than the sum. And I think that's actually just now starting to solidify. Even though universities have been thinking about it and talking about it and doing it, real interdisciplinary collaborations I think are now becoming a real reality.

Bill Glovin:

Well, I think that's a good note to end on. I can't thank Susan enough for the article and for you taking the time to do the podcast. Again, the article is called "[Your Brain on Art: The Case for Neuroaesthetics](#)," by Susan Magsamen, and you can find it in the middle of the homepage at dana.org. You can also find this podcast and all our podcasts in transcript form. I'm Dana Foundation executive editor Bill Glovin. Have a great day and thanks for listening.