

## Stimulating the brain with Damien Fair

The MacArthur Foundation “genius” discusses his return to his home state of Minnesota and why it’s important to protect the developing brain.

1 FEBRUARY 2025 | by BRADY HUGGETT

---

*This transcript has been lightly edited for clarity; it may contain errors due to the transcription process.*

[opening theme music]

### **Brady Huggett**

This is “Synaptic.” Welcome. You have found our podcast that looks at the people, the research and the challenges of the neuroscience space. This is Episode 19 of “Synaptic.” My name is Brady Huggett, and I host the show—just hold on one second.

[music]

For today's episode, let's go back to 1826, and let's go to the General Hospital Society of Connecticut, which was founded that year in New Haven as a charity. The hospital was meant to provide health care to the poor, and the facility had just 13 beds when it opened, and it cost \$13,000 to build back in the 1800s. Now, eventually, the hospital expanded to serve the public more generally, and it began treating sailors coming off the ships docked in New Haven Harbor.

During the Civil War, some 25,000 U.S. Army soldiers were brought to the hospital for treatment, and eventually, in 1965, after forming an official agreement with Yale, the facility took on the name Yale New Haven Hospital. Now today it has more than 1,500 beds. It's a nonprofit hospital with a range of specialty services, and it is the primary teaching hospital for Yale School of Medicine, and it is here, around 2001, that [Damien Fair](#) took a job after finishing his Master of Medical Science degree in the Physician Associate Program at Yale. That is our guest for today, Damien Fair.

Already at the point of taking the job, Damien knew he was probably not going to be a clinician, he said, but he wasn't sure what was next. He took a PA position with [Steven Waxman](#), chair of the neurology department then, and [Larry Brass](#), a neurologist at Yale School of Medicine and an expert on stroke. Working with those two men, Fair was exposed to a lot of basic science research, he said in this episode, and he also came in contact with noninvasive imaging experiments with functional MRI.

His mind was blown by that, he said, how he was able to look inside someone's brain and see how things were working without opening the skull. From that point on, Fair knew that doing research and understanding the brain was what he wanted to do. We talked about that on this podcast. We also talked about basketball being his first passion and how it felt to relocate to Minneapolis not long after George Floyd was killed by police in that very city. Of course, we talked about mapping the brain's functional neuroanatomy and how that relates to mental health. All of it, fascinating stuff, that's coming up in the next hour.

I recorded Damien on November 12<sup>th</sup>, 2024 at the Masonic Institute for the Developing Brain in Minneapolis, the last interview I did in 2024. It was windy and cold that day, the temperature around freezing in the morning. I met Damien in the institute's video and audio studio, and I set up mics across the table, and we settled in. That should be enough to set you up for this. Here is your episode of “Synaptic” with Damien Fair, starting right now.

[music]

Well, listen, first off, thanks for making the time. I really appreciate it. My first thing that I want to talk about, you actually are from here.

**Damien Fair**

I'm from Minnesota, yes.

**Brady Huggett**

By birth?

**Damien Fair**

No. I'm actually originally from Miami, Florida, but then my mother is originally from Minnesota. I moved back here when I was very young, 2 or 3 years old. I grew up here. This is home.

**Brady Huggett**

You grew up here.

**Damien Fair**

Originally from Miami, yes.

**Brady Huggett**

Your mother is from here.

**Damien Fair**

Yes. She's from Worthington, Minnesota, actually.

**Brady Huggett**

How did your family start in Florida?

**Damien Fair**

She actually lived down there at the time and then moved back after she had me. She moved down there for a relationship and work and things like that, and was there for a while, and then eventually came back.

**Brady Huggett**

Do you know how your parents met?

**Damien Fair**

Yes. I don't really know my biological father, but my stepfather, they met when I was really young, not too much after we moved back, I probably was like 4 years old or so, in Worthington. He's a musician at the time and was traveling around in this band and was in town, and they met. Then they eventually got together. He got his computer science degree and ended up working for IBM after he gave up the roadshow.

**Brady Huggett**

I'm not going to know this band, am I?

**Damien Fair**

No. No. They had a couple of big openings way back when, but this is way back. You probably won't know them. They're called Suntouch.

**Brady Huggett**

Sun Touch?

**Damien Fair**

Yes.

**Brady Huggett**

No.

**Damien Fair**

Anyway.

**Brady Huggett**

No. Sunvolt, I remember that. What kind of band was this?

**Damien Fair**

They had a rock--

**Brady Huggett**

Well, what did he play? Maybe that's a question.

**Damien Fair**

He played guitar.

**Brady Huggett**

He was a guitarist.

**Damien Fair**

He did guitar and vocals, but mostly did the lead guitar and lead of the band.

**Brady Huggett**

OK. They came through, did a show in Minneapolis?

**Damien Fair**

No, in Worthington.

**Brady Huggett**

Oh, in Worthington.

**Damien Fair**

They'd done a bunch of shows in Minneapolis, Chicago, but they were traveling everywhere. They were artists all over the place.

**Brady Huggett**

Your mom knew the band, or just happened to be at the show?

**Damien Fair**

Just happened to be at the show, actually. Her sister, at the time, dragged her out, and they met, and that was it.

**Brady Huggett**

He left the band, came here.

**Damien Fair**

Yes. Exactly.

**Brady Huggett**

Not to Minneapolis, but came to Worthington or whatever.

**Damien Fair**

Not Worthington. By the time he quit the band, when they broke up or whatever, we were in Winona, Minnesota, at the time. Then he moved there, and he was a history- [unintelligible] but he had a master's in history, of all things, but of course, it's almost worse than him being in a band, as far as, like, money.

**Brady Huggett**

Yes, of course.

**Damien Fair**

He went back to school, first doing electrical engineering as a vocational, just for work, and then also computer science. My mother's a court reporter, actually worked in Wabasha County, home of "Grumpy Old Men."

**Brady Huggett**

All right. I know that.

**Damien Fair**

Then when he got done with his degree, it really kicked off their career, because he got a job at IBM in Rochester. The home of IBM was in Rochester, Minnesota, at the time. He commuted.

**Brady Huggett**

Oh, I see.

**Damien Fair**

He would commute to Rochester.

**Brady Huggett**

You consider that your father, I guess?

**Damien Fair**

Yes.

**Brady Huggett**

Your mother's a court reporter. She did that the rest of her career?

**Damien Fair**

She did. They retired, I don't know, seven or eight years ago. At the time, we were living in Oregon, just before my commute back to Minnesota. After they retired, they sold the house and moved out to Oregon to be around grandkids and live out there for a while. Then, we moved back. They moved back with us. Now they're in the Twin Cities now.

**Brady Huggett**

Oh, OK. You're growing up with this father who's musically talented. He's also a computer scientist. Your mother's a court reporter. I think that you had an interest in science, because I know where you went to high school. Did you have an interest early on that you knew of?

**Damien Fair**

I did. I say yes or no. A lot of people don't know this, but I wasn't always the best student. In fact, I was OK, but I was a goofball and got in trouble and all that stuff for a long time. The only thing I was really good at was math. I was always good at math, but because I was a little bit of a recluse and stuff when I was younger, I had actually a purpose, stay in the lower math courses and classes so I could be with my buddies.

**Brady Huggett**

I know that feeling. Yes.

**Damien Fair**

I was good at math, and I was very interested in, even way back in the fourth grade, in the brain. For whatever reason, I was like, I want to be a neurosurgeon.

**Brady Huggett**

Really?

**Damien Fair**

Yes. I don't know why. I was very curious about the brain and neurons, and because I wasn't such a good student, I remember actually that the teacher at the time laughed at me when I said it.

**Brady Huggett**

You're going to be a neurosurgeon.

**Damien Fair**

Yes. I was going to be like, in the class, and she started laughing. I remember this very specifically. She's like, "Well, do you even know what a neurosurgeon does?" I really didn't, but I knew they dealt with neurons and the brain, and for whatever reason that interests me. It's funny. Then, of course, you go through this entire life course, and eventually, it came back to that. It's kind of been fascinating. It's always been there. In college, I was biology and chemistry. I was premed. It was the natural thing to do. Actually, probably my spark in the sciences at all, probably what really propelled me was the time at my high school when I got--

**Brady Huggett**

This is the Minnesota Academy of Math and Sciences, or for Math and Sciences, right?

**Damien Fair**

Yes.

**Brady Huggett**

I don't know how that works, but you have to aim for that? You want to go to a school that is focused on the math and sciences, or is that just for--

**Damien Fair**

No, it wasn't like that at all, actually. My high school was Cotter High School. It's a small, private Catholic school in Winona, which my mother, who, education was very important to her. She grew up in this Catholic family and Catholic schools. When we got to Winona, she's like, I don't even know how she afforded or anything. I don't think she probably had to pay but was putting me into this Catholic school system.

I did great. It was a really good experience. I really turned my academic mind around when I got to high school and essentially just started trying and getting curious about stuff. The sciences really picked up for me. There's the Hiawatha Foundation. They're in the group there that's that was led by Bob Kierlin and a few other philanthropists who really support the school system, and actually the entire region. They had a vision to start this new Academy of Math and Science that was connected with my high school.

**Brady Huggett**

OK, all right.

**Damien Fair**

I was actually the first class. Which was probably lucky, because I probably wouldn't have been able to get in if I wasn't first. There was an application process, and we got in. Then we were just exposed to all this. It was a huge investment at the time. We were just exposed to all this new technology, things that you get lucky to do if you're in college. At the time, PCA, or how to code DNA, was just coming online.

We were doing that as high school students. It was wild. Then, not only that, but we got college credit. This was before the proliferation of AP classes and all this stuff. We got college credit. We did work with some of the local colleges; it's a college town. We had a huge experience. Then, when I actually went into college, I went into, like I said, biology and chemistry. It was like, as advanced, as far ahead.

It just made it easier, super prepared. It made it really easy to make it through. I was a basketball player. The reason why I ended up at Augustana College in South Dakota was because of basketball, for sure.

**Brady Huggett**

Oh, I didn't know that. Did you play there?

**Damien Fair**

Yes, I played there. I got a scholarship to play there. My parents said, "Looks like we found you a spot."

**Brady Huggett**

I want to go back to one thing. In fourth grade, you say you want to be a neurosurgeon, and the teacher laughs at you because, frankly, who in fourth grade actually says that or maybe even knows what that is, but you said you remember that.

**Damien Fair**

I don't think I was thinking, I wasn't really thinking at all when I was at it. I do remember being nervous that I didn't know the answer to the question. It's more when I look back and I remember the moment because it stuck, even though I wasn't offended or anything at the time. I remember being like, why is everybody laughing at that? It's somewhat vindicated as you--

**Brady Huggett**

It worked out.

**Damien Fair**

And it worked out, yes,

**Brady Huggett**

You said you were not doing well in school because it sounds like you weren't interested. Obviously, the intelligence is there. It was like you weren't interested. When you got to this high school, there were so many new things that you couldn't help but be interested in it?

**Damien Fair**

Yes, I feel like there's a couple of things that probably changed. One is the environment at the high school for just the academy was different and unique and the people were motivated, the teachers were motivated. Just the vibe was different, number one. Number two, probably, and maybe it was the most important, is that probably that my peers in the cohort that I started becoming close with at that time were, they're all go-getters.

Even now, everybody's out in the world doing crazy, amazing things. It's just that peer influence probably was a big shot, too. Plus, I'm a competitive guy. If I'm hanging out with people and they're doing better at something, I'm not going to allow that. There's probably a bunch of the environments, my peers, and then just having access to things that normal kids don't have access to, that just had a spark in me. Then all throughout high school, I became one of the better students in the school, even though before then, I was not.

**Brady Huggett**

You also must have been one of the better basketball players in the school.

**Damien Fair**

Yes.

**Brady Huggett**

How tall are you?

**Damien Fair**

I'm 6'3".

**Brady Huggett**

I'm assuming you also were playing basketball all the time growing up. This was a big passion of yours.

**Damien Fair**

Yes. Probably, that was number one.

**Brady Huggett**

You had more passion.

**Damien Fair**

For sure.

**Brady Huggett**

When you get out of high school, did you have dreams of playing in the NBA? Was that in the back of your mind?

**Damien Fair**

Yes and no. I traveled around with folks from the select team here in Minnesota, around the country, and with the AU teams; it wasn't as big as it is today. Probably at that time, I did, but then, as I went through the process and everything, I was slowly fading a little bit. I would say by the time I was done with college, I was done. I had a lot of friends who went overseas and played and continued on the journey. For me, I had ambitions to go back to school.

**Brady Huggett**

Oh, there were other ambitions.

**Damien Fair**

Yes, my headspace was different.

**Brady Huggett**

OK, so you go to college, your major's biology, I think your minor's chemistry or something like that. You're playing basketball for four years. When that ends, I don't know, you're probably like, "Well, I'm not going to the NBA, but anyway, I've got this other stuff I'm really good at." You were thinking about medicine. This is like the neurosurgeon came back around? The idea.

**Damien Fair**

Yes, well, I was premed. I was biology, chemistry, but premed. Really, I was playing basketball. I would say my headspace now, where I am as a professor and stuff, even in college, probably wasn't really there. I was good at school, and I could do it, but I wasn't all in. Now I'm looking at these kids in undergrad that come and work in my lab and stuff, and they're just blowing me away at their skill sets, their maturity and all that. I wasn't even remotely close at that age.

I was on a path, I was just doing what people told you you're supposed to do. I'm premed, I get the grades, and then you apply and you just go down the road. Then I did a few things. One is I did a bunch of shadowing, and I even shadowed a resident who they were not very happy during resident, during training. You shadow and you do stuff with the physician who's well-established and been there for a long time, and they're always like, this is the best thing since sliced bread. You go to someone who's in training for four to eight years of residency, during that period, and it's not so fun.

**Brady Huggett**

What were the complaints? I work too much? What kind of doctor was he?

**Damien Fair**

Oh boy, probably orthopedics. I don't even remember, to be honest. I was into orthopedics at the time, partly because of the sports. I don't remember, but what I do remember is that I just knew that, boy, I better be damn sure this is what I want to do, because you're locked in, once you make the leap, I decided to hold off, and when I got, from one of my friends who was actually at school was looking into this physician assistant or physician associate programs, which are trained like medical models, it's only two years, it's a good profession.

I said, "You know what, maybe I should just do that for a couple years, and if I like it, I can still go back to medical school. If I think that this is enough, it's a great profession. If I want to do something else, it's only two years, I can do something else

too." Instead of going to medical school, I took a year and then applied to these physician assistant programs, was accepted into Yale University, and then went there for a couple years.

**Brady Huggett**

That's a great school. You're setting your bar this high. Did you apply to Harvard? Did you apply to, I don't know, Stanford? Those kinds of schools for this?

**Damien Fair**

No, I didn't. Where did I apply? I don't remember why I applied to Yale. It was one of a few, but I applied to like Mayo. I applied to schools in Iowa. I'm a Midwestern kid, right? In a few other places, but I didn't apply to any other places on the East Coast that I remember. I do not remember what the impetus of me applying there, but it must have been something that someone told me, something about the program that I liked. Yes, I applied and got in.

**Brady Huggett**

You left the Midwest then?

**Damien Fair**

I left the Midwest for the first time, yes. Which was a trip, yes.

**Brady Huggett**

We should say your college was in Sioux Falls, right? That's in South Dakota. That's not far from here. You've been in this area. When you get to Yale, did you feel overwhelmed at all? Meaning you've come from the Midwest, and here you are at Yale, and it's got the best people over the world or I don't know.

**Damien Fair**

Oh yes. I was very nervous when I started. I felt very much like an imposter. There were so many ridiculous stories that looking back, they're hilarious now. I was so naive. When I left South Dakota, I obviously didn't have any money. I left South Dakota. I was living in this basement of this large house.

I had my own bathroom, my own bedroom, my own living room, and I paid \$100 a month for rent. I can't go out the East Coast to look at places, I don't have money to do that, so I'm just doing everything sight unseen on the internet, and I'm finding places like \$400, \$500. I'm like, "Oh man, these places are going to be amazing."

[laughs]

**Brady Huggett**

This is going to be an entire house.

**Damien Fair**

"This is going to be awesome." I find a place out there, and I have to sign the lease sight unseen and everything, and then I get out there, and it's a complete disaster. My first place was just a nightmare on Orange Street in a ghetto out there.

**Brady Huggett**

Did you leave that place or did you stay?

**Damien Fair**

Eventually after a year, but I'm in there for a year.

**Brady Huggett**

You're trying to study?

**Damien Fair**

Yes. It's. I was a kid, so everything is fine. I felt very much like there's a new culture, new environment, and then—now I can teach my kids that they shouldn't feel this way, but you're walking into this place which is this storied history, in this societal



perception. I'm just sitting there looking around my class, and I remember this very specifically like, "Oh my God, I'm dead. I'm going to get killed in this place."

Of course, maybe within a week, or a very short period of time, as you get to know people, get their background, you talk a little bit, you realize, "Oh, they're just the same," and it's like, "It's all good." I decided, fine, and it was great. I knew right away when I finished that I was probably not going to be a clinician, it was not my bailiwick work, even though I did fine in school and everything.

I got a job at Yale, New Haven Hospital in the neurology department. Steve Waxman was the chair at the time. This guy who's now passed away, his name was Larry Brass, was a really famous stroke vascular disease neurologist who was looking for a PA to help them with his research, but also help with his practice on the wards and in clinic. My brain went back to the research element. I talked to Steve and Larry about getting this position -- that I'd be a good position -- though I had no experience, and they agreed.

They brought me on and really exposed me to a lot of basic science research. I worked with [Bennett Shaywitz](#), and some of the residents on some initial imaging experiments. I was still practicing as a clinician, but I was doing this bit on the side almost like a resident. Then my mind was blown at the idea that some of these noninvasive imaging experiments with functional MRI where I could look inside people's brains and see how they were working without actually even touching it.

### **Brady Huggett**

You were doing it almost like a clinician, like, "We're trying to diagnose something," but then you realized that you could just try to figure out the brain in general?

### **Damien Fair**

We weren't using fMRI in clinical practice, but me and some other residents were designing experiments to help answer questions related to clinical phenomena in neurology, particularly around stroke. We were designing experiments to do with this at the coffee shops and stuff. Of course, they were terrible, terrible experiments. Oh my God, I think about. We had some mentors there and some folks that really allowed us to explore even though they probably knew these are terrible experiments. It never worked, they didn't make it anywhere, but it did really light the spark and said, "OK, this thing, doing this research and understanding the brain is what I want to do."

### **Brady Huggett**

There's a couple of things that I think also happened here, one is you meet your wife Rachel at Yale, somehow. She's in the medical track?

### **Damien Fair**

Yes. You ask me that, you know a lot about my history, but it's funny. I'm leaning into all these funny stories. My first year in school, all the PAs and the medical students, first-year medical students, they do all the neuroanatomy, or not neuro, the anatomy course together. We were in the same course doing a lot of learning around anatomy, neuroanatomy, cadavers, the whole nine yards, for school.

We also realized during that time that she has family back in Minnesota, she's originally from Ethiopia, but a huge chunk of her family, brothers, cousins, aunts, uncles, they live here in Minnesota, and so she travels back to Minnesota for the holidays. We learned that we were both going to be coming back to Minnesota for the holidays, and so we hung out. First time we ever hang out was actually here in Minnesota, even though we both met at Yale. There's even a funny story where-

### **Brady Huggett**

It's like a rom-com.

### **Damien Fair**

Yes. We hit it off. There's even a funny story where we had separate flights and stuff even going back to New Haven. Her flight got canceled. I remember sitting there, I was still in basketball gear back in those days. I got my hat on, whatever, the long shorts and baggy whatever. Even though I knew we were on separate flights, all of a sudden I look up, and I see her walking down the aisle at a different airline even. I'm like, "What happened?" She changed--

**Brady Huggett**

You're on a plane?

**Damien Fair**

I'm on the plane. She was able to change her flights from a different airline to the same one I was on so we could go back together at Yale. After we went back, we went out a few times and that was it, and now we're--

**Brady Huggett**

That was the beginning of the relationship?

**Damien Fair**

That was it. That was 1999, so 25 years.

**Brady Huggett**

I know that you went to Washington University after this, I think, for your Ph.D., but that's because of the two, you got accepted there, or something. It was the two-body problem.

**Damien Fair**

Two-body problem, but still before you're looking for jobs, that was residency and graduate school. We've been going back and forth on who's got to give in to what's the optimal thing. She's an absolute rock star. She's in medical school at Yale. Even as an undergrad, she had written a book on women and violence.

**Brady Huggett**

Really?

**Damien Fair**

Yes. [laughs] She's like, "This is ridiculous." She came to the U.S. for undergrad at Franklin & Marshall. Coming to the U.S. under a full scholarship from Ethiopia, that is not an easy thing to do; it requires, all the stages that's required to get the type of education, or even to allow her to do that when you have no money is ridiculous. She's completely insane, is academic. Everybody wants her. Me, I'm OK. Clearly for my trajectory and for my graduate school, the best place for us to go after lots of learning and understanding and meeting people was certainly WashU.

Probably wasn't at the time the best for her because she could have gone anywhere she wanted for residency. At the end, we decided to go there. Ended up working out great for her. She met one of her life-long mentors, Louis Wallace, who does a lot of international work in fistula work in women with pelvic birth injuries, was a great mentor, but it wasn't her top place. She was really supportive, and we ended up going there. I did grad school there.

She finished residency, and then we swapped sacrifices where we both went to Ethiopia for a year while she was doing a fellowship there, a year of gynecology fellowship. Then she matched for a year of gynecology fellowship in Oregon. Then I went--

**Brady Huggett**

To OHSU?

**Damien Fair**

At OHSU. Let me go find somebody to work with.

**Brady Huggett**

Can I ask you about Ethiopia?

**Damien Fair**

Sure.

**Brady Huggett**

Was that your first time meaningfully being out of the country?

**Damien Fair**

Let me think. Gosh, was it? Now I travel all over the world, but back then it might have been, to be honest. I think it probably was. I had been in Mexico and Canada and stuff, but no, that was probably it. I didn't travel growing up. That was it.

**Brady Huggett**

Why would you be suddenly going off to-

**Damien Fair**

That was probably it. It's funny to think about it that way.

**Brady Huggett**

The first time that really happened to me, and I was in my 20s when I really for the first time left the country, not like Canada or Mexico, as you said, and I was gone for months and months. I realized it changed my view of myself as an American. I didn't think I was particularly American. I'm just a person in this country. When you leave, you're like, oh, you're an American to everybody who meets you. That's the first thing that identify you, you're an American. By the way you dress, you speak, everything, the things you know, and did you have anything like that?

**Damien Fair**

No, it's completely different experience. I would say for me because I was going to a country where everybody's Black, it was almost the opposite, where I just fit in. It was like, that is not normal for my normal life.

**Brady Huggett**

Certainly not Minnesota.

**Damien Fair**

Seeing the sea of just-- That was a weird experience for me. It was fascinating. On top of that, I also, even though I'm taller, I also have a lot of Ethiopian features, so people oftentimes think I'm Ethiopian.

**Brady Huggett**

That's what I mean. When they talk to you, and they realize you're not, and they go, "Oh, he's an American." Then you're suddenly put in some other category. Did you feel any of that?

**Damien Fair**

Not really. Not in that culture. It's just different. People are very welcoming. I don't remember that, but it's also very funny because I used to work very closely with her dad even before I went to Ethiopia on learning Amharic, the language. Then I would speak a little bit. If you speak any Amharic at all to an Ethiopian, they think it's hilarious. It's just so fun. Anyway. I guess we probably were in some boxes. I think they're probably even maybe more for my wife than me, because once they're gone for so long, they become this diaspora. There's a different feel for the Ethiopians. I was mostly very welcomed, and it was a great year. I wrote my dissertation there.

**Brady Huggett**

Oh, you did?

**Damien Fair**

Yes. I was pretty much done with all my experiments. I probably could have graduated. Then when she got that fellowship, I just asked if I could spend a year there writing my dissertation in papers, because I was pretty much done. My committee said that was OK. Then I went and hung out in coffee shops. I learned the culture and wrote my dissertation.

**Brady Huggett**

You're at OHSU. What year did you go there for your first year?

**Damien Fair**

My first year there was 2008.

**Brady Huggett**

2008. Just tell me where I'm wrong here. I think you start pushing, or at least it seems like you're given credit for starting pushing for bigger studies that are looking at the brain, using fMRI, not necessarily structurally, but for connections. Is that correct?

**Damien Fair**

Yes.

**Brady Huggett**

The Human Connectome Project starts in 2011.

**Damien Fair**

Yes. There was a lot of efforts at that time. There was a feeling that we needed larger datasets and more time points of data. We had started, which now is called the Oregon 1000, a sub-initial, big projects like that, that lasted for almost 10 years, me and [Joel Nigg](#) on building up some huge datasets. I was working closely with Mike Millam and a few others on building competitions, aggregating data, things of that nature, because we knew that data-sharing, stuff like that, it needed to be to get bigger datasets. We were pushing. I don't think we realized at the time how important it was, even though we just had a feeling that we needed to do better.

**Brady Huggett**

The Oregon 1000, that's 1,000 people?

**Damien Fair**

Yes, kids.

**Brady Huggett**

Adults? Kids, OK.

**Damien Fair**

Yes, kids and followed with ADHD, autism.

**Brady Huggett**

I was wondering how. OK, so that's how you began to turn to autism and ADHD.

**Damien Fair**

Yes, when I finished graduate school, we had a lot of papers that really took off and some phenomena discovered that we realized, that I realized very early on that there's a high potential that we could leverage some of these new techniques and technologies and noninvasive imaging to better characterize, understand and eventually treat mental health disorders. It's funny because I'm getting back to my clinical after doing a bunch of basic research.

I'm getting back now into my clinical mindset where I always wanted to figure out how this work could be juxtaposed next to assisting with some various types of clinical phenomena. I didn't necessarily think it was going to be in psychiatry because that was not my thing, it became very obvious that these techniques are perfectly set up for these mental health disorders because studying them with traditional fMRI, which requires tasks and performance and all this stuff, was very hard to do. People were trying, but it's extremely hard to do it well when you have mental health sequelae.

With this new resting-state functional connectivity and things of that nature, that wiped out some of those big bottlenecks, and you just could see, oh, this could really-- maybe there's a path here. I teamed up with [Bonnie Nagel](#) first and then Joel Nigg, who's world-renowned in ADHD research and in particular phenotyping kids with mental health disorders. What I brought to the table was all this imaging work. What he brought is this phenomenology.

Now, a lot of people think I'm an ADHD researcher. I'm not tied to doing work in ADHD. We started there mostly because of convenience and as a model because it's widespread, there's increasing rates, it's a big deal. We could test a lot of our ideas on subtyping and personalizing what we're looking at in kids and really testing the waters about what's a better way of characterizing the brain phenomena that correspond to some of these disorders as opposed to just following like DSM categories and things like that. That really took off at that time.

**Brady Huggett**

I'm not going to remember the name, but the acronym I will: FIRMM. Is this where you started to build the FIRMM software or think about that?

**Damien Fair**

Yes, a little bit. There's all these events that occur over time. One of the big events that kicked this off was a discovery that motion-related artifacts and imaging could be clouding what we're seeing and actually making us believe things that we're seeing that's not in the brain, that are purely artifacts of motion.

**Brady Huggett**

Let's talk about that. That means that if I'm in a scanner or a child is in a scanner and they move their arm or leg, the brain is aware of that or maybe even initiates that, and that is clouding the scanning.

**Damien Fair**

No, it's a little bit different. Yes, if you move your arm or leg, you can see activity in the brain related to that movement. If you move your head, then it's like trying to take a picture of, well, it's like trying to take a stationary picture of Usain Bolt flying down the track. It's going to be blurry, there's going to be things. You're going to see a picture of Usain Bolt that's clearly not a precise picture of him because it's blurred; there's artifacts; there's issues with it because there's motion.

**Brady Huggett**

That's because the brain is actually moving.

**Damien Fair**

Because the brain is actually moving.

**Brady Huggett**

Got it, OK.

**Damien Fair**

That was leading to artifacts in the brain that was making us see things that are not real. Many people started to work on ways to deal with the motion issues post data collection.

**Brady Huggett**

By zeroing things out or trying to find commonalities that you would zero out.

**Damien Fair**

Exactly. By getting rid of picture frames that have high motion or different techniques to filter out the noise. There's all different types of stuff over the years that have come of that work. At the same time, myself and my other close friend and colleague, [Nico Dosenbach](#), were in parallel working on methods to essentially deal with motion at the source, like while you're collecting it. How can you deal with motion while you're there?

We've got our teams that team up with this idea of monitoring the motion in real time for the people that are running the scanner, so they could help adjust, A, provide some feedback to the patients about their own motion, but also adjust your scanning based on just understanding whether there's lots of motion because usually you don't know until the patient's gone and they're at the house, and you get the data back in your lab, and you realize, "Oh my God, this is useless."

What we said, wouldn't it be great if you just knew in real time the quality of the data, then if you needed to stay in there for two more minutes or three more minutes to make it a quality scan, you can do that. We started working, developing a tool for

doing all that at the scanner, and the funny thing is we tried to get that work. We calculated how much money we would save by just not losing scans, and it was an enormous amount of money.

When we went to the NIH to try to get it funded, there was no obvious box at the time where this would fit in, no program. Even though we'd be saving a lot of money, it was very frustrating because we didn't even apply for a grant. Nico had been connected and been on some boards with some investors and some VCs, was complaining about our inability to do something so obvious, and one of the investors who's also a friend, said, "You know what? We should just turn it into a company." We said, "Sounds good." We got a little initial investment, then started; at that time it was called Nous, and now it's called Turing.

**Brady Huggett**

Was it bought?

**Damien Fair**

What's that?

**Brady Huggett**

Was it bought? Did Turing buy Nous?

**Damien Fair**

No, it was just a shift in the name.

**Brady Huggett**

Oh, I see. OK. You're not part of the business, are you? Are you on the board or anything like that?

**Damien Fair**

I'm on the board, yes. I'm on the board now. Not, uh, I'm a founder, but I don't do any of the day-to-day operations.

**Brady Huggett**

OK, so tell me how you got back to Minneapolis, or back to Minnesota.

**Damien Fair**

Yes, so, well, first, we love Oregon. We love Portland. I had been being recruited for a long time at different venues to go and start a new center or to build up my program, to start something new with other places. It was always going to be a heavy lift for us to leave Oregon because we just loved our life. Our kids were connected there.

**Brady Huggett**

You had two kids?

**Damien Fair**

Yes.

**Brady Huggett**

You do have two, and they were both born in Oregon?

**Damien Fair**

One was born in St. Louis. Then the other one, yes, was born in Oregon.

**Brady Huggett**

OK, so they were growing up in Oregon at that point.

**Damien Fair**

Yes, exactly. I think there was a couple of things that there were some roadblocks that were occurring with my wife's international work, with the university. Even though she loved her job, I think she said, "We need to start taking some of these

things seriously about potentially moving." We went and started taking up some of these offers of going and visiting and checking out places, and then actually putting on paper and building up our vision of what we really wanted.

This coincided, in essence, here at the University of Minnesota with this effort where we're at now at MIDB to build out a large center on child brain health that almost mimicked exactly what my vision was of where I wanted to take our work, where I knew and became accustomed to realizing that the only real way for the basic sciences, like the work like mine, to really, really have an impact quickly is if you're connected with all the different pieces and joints and things that are required to make that go.

That means it's like clinicians and insurers and commercial and regulatory people and state agencies. There's just this to make things move quickly. Typically, it takes 17 to 20 years for a new discovery to actually get in the hands of a person or people or policy, education, clinical practice. The only way really to speed up that process, and you don't know this when you start until you try and you realize, "Oh my God, this is like so complicated." We had this vision of pulling different types of teams together to accelerate new discoveries into practice and to learn from our community about what we should be focusing on.

It lined up with the vision of this new entity, of this new institute. Of course, there was really good opportunities for my wife here as, like I said, the director of Women's Global Health and to expand a lot of her work. It just became a really nice fit, and we decided to pull the trigger.

**Brady Huggett**

You were able to help develop how this institute looked then?

**Damien Fair**

Absolutely, yes.

**Brady Huggett**

That was the whole point.

**Damien Fair**

Yes, myself and my co-director, [Michael Georgieff](#). Of course, there's contributors from a bunch of stakeholders, from College of Education and Development, the medical school. There's lots of contributors. Everything from the design of the space that we're in right now to what the clinical practice would look like, to how the research support structures look like, how everything's funded, everything was designed--

**Brady Huggett**

Part of the recruitment for you, it was like, "OK, we want to recruit you, and we want you to help us figure out how to do this."

**Damien Fair**

That's right.

**Brady Huggett**

OK. The reason it takes so long for something to go from basic science to discovery, you said whatever, 16, 17 years, it's partially that's because academia is so siloed. You're just sort of doing your thing in your lab, and then you might publish a paper. If you're like, if we can bring that all together, you can just-- If everyone's aware of what's happening, you can just move much quicker.

**Damien Fair**

Absolutely. I call it like the baton handoff. I've been very fortunate to be around some amazing mentors, have some projects and ideas that worked, which is rare sometimes in our work, that's led to big papers and things in *The Economist* and *The New York Times* and things like that, which is super exciting, and it gets your adrenaline going, and it's all-- Then you realize, what's the next step? You start over. You continue to do it again. It's like, it's just this cycle. When you're done, then you just have to wait until somebody can see that discovery and say, "Oh, I have an idea. I could use it in my clinical practice this way." Or, "Oh, I wonder if I could tweak my education program if I knew this thing."

You're just waiting for someone just by chance to see it and have the vision to be able to think about it. There's no baton handoff. There's no person you can say, "Hey, can you now take this to a clinical trial? Have I designed this the right way that it can be applied in the community, this clinic setting this way? Here's my representative. Did you see this result? Maybe we should support this bill that's for child care from birth to three." You're just sitting there and waiting, and there's not the next step. Oftentimes, we're a scientist we think we have superpowers where we just can understand everything. Of course, we can't.

We just think in our brains that we can somehow by magic get things to move on to the next stages, but you can't. It's just like you need completely different skill sets and different people who have a completely different mindset to grab it and then move it to the next phases.

**Brady Huggett**

I think you came back here in 2020. I want to ask a couple of things. One is, George Floyd is killed in 2020 in this town. When did you move here?

**Damien Fair**

July of 2020.

**Brady Huggett**

Yes. How was the city then?

**Damien Fair**

It was quiet. It was an interesting time for me because it was a homecoming, so to speak. It's right in the middle of the start of the pandemic. The movement and the activity that I'm used to in the city was just not there. My son at the time was just about to start to drive, and my daughter was very young. Coming into my home after the events of George Floyd was very hard, and it required a lot of discussions with my kids and family about interacting with police and what to do when you're driving and how to act. Things that I probably wouldn't have even done if it wasn't for those events because you just don't even think about it, but then you're just nervous.

I do remember, the impact on our kids was monstrous. Not my kids personally, but just kids in general was monstrous. I remember we, my wife and I, my daughter, how old is she? She was probably, I don't know, second grade, maybe. Yes, second grade. We were driving down to the George Floyd Memorial. She was so terrified.

**Brady Huggett**

Because there were activists still there? There was protests or just the concept of going there?

**Damien Fair**

Just the concept of going there because she wondered whether we should paint our faces white.

**Brady Huggett**

Oh my God.

**Damien Fair**

So we wouldn't get hurt by the police, and she's in second grade. It's hard to really imagine how much some of these things impact just the--

**Brady Huggett**

How do you handle that? Because the issue, it's such a ridiculously complex issue that encompasses all the history of this country. Her thinking is, Well, if my face was different, I wouldn't be in any trouble here. How did you explain --

**Damien Fair**

It was a history lesson, a remembrance. It was a very positive experience overall for us to be there and to see it and to be part of it. There were still some marches and whatnot going on, organizers and all that was very positive for my kids to see, the



importance of community organizing and working towards advocacy to what you believe. I think that's all very positive. Of course, we mostly just comfort her and say, "Oh, it's OK."

Then have some experiences where things end up being OK and then it's all right. It just goes to show you the impact that all these events around us are occurring. There's actually other positive, funny stories that are similar with my kids in the same vein, which is almost the complete opposite. When my son was almost 4 years old, again, this is when we first moved to Portland. He's in preschool with one of his good buddies who's now still a really close friend, who's white.

His parents came up to me, we were just meeting them, but now their family's really close with us, came out to us and said, "My son, we're so happy they met. He wants to be Black like Amos." I'm like, "I don't know what that means," but it was like, "OK." I'm introducing his parents to my wife, and I said, "Oh, he wants to be African and wants to be Black like Amos, our son." We're laughing.

He was like, "No, no. I didn't say he wants to be Black like Amos or African American like Amos. He said he wants to be American like Amos. You misheard me. I said he wants to be American like Amos." I was like, "Really?" I said, "Why does your son think that Amos is more American than him?"

**Brady Huggett**

Yes. Was he not born in the country?

**Damien Fair**

He was born in the country. It turns out it's 2008. Barack Obama was just made president. There's some belief that the only way you could be American is if you looked like the president. It just goes to show you the developing brain how they're influenced by all these events around you. It's monstrous. Of course Barack Obama was our first Black president ever. You just go back and imagine like, man, think about what's happening inside these kids' heads. It's amazing. It has a huge influence on who they are.

**Brady Huggett**

OK. Right. You were giving an interview someplace and you said this super fascinating thing, which I wanted to ask you about. It was that when we're born, we have all the neurons in our brain already. By 2, all the connections are mostly formed. If you think about that, and it's like the human brain is basically just shaped from that point on.

**Damien Fair**

It's more like building a sculpture out of a formed rock than it is building a house from the foundation up. You're chipping away at the rocks to make this beautiful sculpture.

**Brady Huggett**

Unique brain that you have. Right.

**Damien Fair**

That's one of the reasons why you're so plastic. Then we have such high plasticity and stuff in the early ages, but in other things as well. That process is definitely in the experiences that we have is how we grow and mature for sure.

**Brady Huggett**

It's just through having experiences over and over, storing them away, linking them up. That's it. I'm not saying that that's not nothing. That's amazing. I was shocked at the brain at 2 being fully formed and then by mass by 5. I think I probably would have thought that, but I didn't really ever do the math that at that point on--

**Damien Fair**

It's about 5 or 6 is about 95 percent of the adult's. That's why they have these bobblehead kids walking all around. They have these big heads and little bodies. That's absolutely right. That's how we develop.

**Brady Huggett**

Yes. Maybe it's because this is new news to me, but I'm fascinated by that.

**Damien Fair**

Here's I think the important thing for folks to conceptualize. What that means is that the initial rock, the initial formation of all the neurons, all the connections, all the stuff that you're going to have for the rest of your life that you're whittling away at throughout aging and senescence and everything, it's incredibly important to get that initial setup right. What that means is that all the neurons are born and they migrate to their place. The interactions with inflammatory response, all the synapses are there, the tracks are formed.

All that stuff is happening in when you're in utero and up through essentially the first year of life or so. It just tells you, like, "Oh my gosh, that period of development is incredibly, incredibly important. Things around nutrition, stress and environmental exposures and all that kind of stuff that we talk about is incredibly important for the developing brain to get us started on the right foot.

**Brady Huggett**

OK. I think there's two things that I want to ask you about. One is, so I was at SFN this year, and I sat in on your lecture, your presidential lecture. Super interesting. All of it was super interesting. A lot of it was things we've talked about, sort of the history of fMRI or scanning the brain. The thing that was probably most compelling is the videos that you're showing at the end. You showed a man named Mike who's treatment-resistant depressive for a long time. You've done this targeted cortical stimulation in his brain.

There's also some of that you were showing for chronic pain, I think, right?

**Damien Fair**

Yes.

**Brady Huggett**

I know that you looked at his salience network or something to try to figure, but I could not really figure out how you were able to figure out where to put the paddles. I know it's not going to be trial and error. You're not going to put him in some, but how's that? I'm sure you looked at a billion scans, but how did you figure out where to first-- Because I think the videos that we saw, that was the first location, the only location for Mike.

**Damien Fair**

No, there's several locations that we were stimulating with Mike. I didn't show different behavioral sequelae. I was showing his responses during the testing where we're done from different spots in the brain.

**Brady Huggett**

You were turning them on and off.

**Damien Fair**

That's right.

**Brady Huggett**

I got it. OK. How did you figure out where to put those various paddles?

**Damien Fair**

That comes from the mapping. It's funny. Now, it's been, gosh, 20 years. We've been at this, working on, it's amazing that it's been that long, but working on really refining the abilities to identify and characterize networks in our brain. Again, I've been doing that very closely with my friend and colleague, Nico Dosenbach, who's one of the cognitive neuroscientists right now in this space. The reality is to be able to do that within a given person, we've struggled for a while.

**Brady Huggett**

I think the question is, and I should have maybe said this a little better, it's the mapping, but how did you know based on his description of his phenotype that it aligns up so well with the map?

**Damien Fair**

Number one is we have the techniques, data collected, processing everything to get the fingerprint of the brain of every individual. We can do that now. When we first looked at his brain, it's fascinating what happens when you have really, really good signal in a picture, because there's no statistics, there's no fancy math, where you can literally just look at the brain, look at the network and say, that's wrong. You can see the pathology in his brain just by looking it up with your own eyes. In my previous clinical days when I was doing stroke, it wasn't very hard to see if someone had a stroke.

You just look at the scan, and there it is, and you can see it. The pathology that you can see with this new technique in these participants and some of these patients that have really severe depression, it's almost like that, where you can literally just see it. You can say, "Oh, this particular system, it's called a [unintelligible], which was very enlarged. It was encroaching on these other networks that 20 years ago have been identified, trying to understand and identify the function for that long. Those functions, those networks map onto the specific types of symptoms and the phenotype of major depression.

You're like, oh, well, but they're very personalized. We said, OK. Then on top of that, so there's one other nugget here, which hopefully it's not too complicated for the audience, but it's [Ziad Nahas](#), who's actually the PI of this study, in 2010, published a paper that did a similar type of technique of neuromodulation, but without the map, where they just put the neuromodulators just blindly in this coordinate space that we thought was in general a place to go for this.

To the credit of that study, three of five patients did well. We pull all this information, the 20 history of understanding the function of these-- identifying these systems and understanding their function, 15-year history of previously doing neuromodulation in the brain, but without that information. Now we can map these systems in every single person so well that you can see the pathology with your eyes. Then now it's just working with the neurosurgeon and planning to place those electrodes right on the right spots. We have a very good surgeon. His name is [David Darrow](#), who, he's really precise.

Then I remember I was driving, and I got a call from Ziad as they started doing some of the testing. He said, "You'd never believe it. This patient, Mike, is crying in tears of joy when we stimulate part of the brain we thought would do that."

**Brady Huggett**

That was one of the videos you showed.

**Damien Fair**

It's like, we got it. We understand. Of course, three weeks ago or four weeks ago, one of our colleagues, and this is all why this is going on, [Chuck Lynch](#) and [Conor Liston](#) at Cornell, they just published this [paper](#) in *Nature*, which validated everything that we did, but they didn't do any treatment, but they were just showing that the same thing that we're seeing in our patients in the phenomenology of the outcomes, they can see in other patients too.

We feel like we got it. We're pretty confident, and now we're pushing forward. It's a baton handoff, with the clinical trials and trying to get this stuff out there.

**Brady Huggett**

Was Mike in a trial?

**Damien Fair**

He is. He's in a small trial that's FDA-approved and all that.

**Brady Huggett**

How many other people were in that?

**Damien Fair**

He's the first, and there's others that are on the list.

**Brady Huggett**

I see. OK. I'm going to ask this question, and I hope it sounds like the compliment that it is, because that is such groundbreaking work, right? Obviously groundbreaking work, but sometimes I also think in 50 years, when we look back, it'll

be like, "God, that was so crude." You can see how, as you said, 15 years of this and 15 years of mapping the brain, you get to this point when you add another 40 years on top of that, it's going to be--

**Damien Fair**

Oh yes. It's happening this-- I wouldn't say 40, I'd say 10. Essentially, there's all these different sectors that have coalesced to allow a new way of therapeutics that's around modulating the brain. That includes, there's computing, AI, clouds, things like that, the math, obviously the neuroscience that I've been just talking about have finally caught up with the engineering and the devices. Not only that, but now commercial and investments and governments are-- All this stuff is coming together.

I can't even tell you how many technologies are out there now of different ways that you can modulate the brain, both invasively and noninvasively through focus ultrasound and magnets and direct stimulation of things on the scalp and things underneath the scalp. There's this plethora of things that are coming out that are ways to modulate the brain in new ways. In 10 years, which ones of these technologies will have one which have become the most useful is not-- I don't think anybody really knows. The only thing that we know for sure is that they're all going to need to know where to go. They need the GPS of the brain. That's what these maps really are.

**Brady Huggett**

You're saying like, that's the most important part is figuring out exactly where to put it in the brain, whether or not it's just under the skin, on the skin, or actually in the brain, we're not sure yet. We're not going to know that for a certain amount, 10 years, as you said.

**Damien Fair**

Yes. There's current technologies we can use today. That's what will be used today, to your 40 years from now, we'll look back and probably say that was crude, but we'll have saved lots of patients. The next generation, which would probably be a lot more simple, who knows things that you can do at home. I don't know. There's a million ideas. There's lots of companies. A lot of institutions are investing in this. Here at the University of Minnesota, we have an entire, it's almost like an industry complex, the support from the state and a lot of effort and support from the university to drive new neuromodulation technologies.

You just look around. You can see it happening. There's a ton of experts here that are really driving the field, and the future is bright in this space. It's a compliment to other ways that we typically try to treat disorders with but usually with drugs and medicines and sometimes with behavioral therapy, but being able to essentially, it's almost like playing keys on a keyboard. In fact, one of the videos I showed you at SFN was of where patient Mike was actually taking orders. He's like, I want a little bit of this and a little bit of that. It's amazing. The future is here. I'm very excited about even the near-term future in this space for sure.

**Brady Huggett**

That's 20 months he'd been with these implants?

**Damien Fair**

21 months.

**Brady Huggett**

21 months. Amazing. OK. That's it. Thank you.

**Damien Fair**

Oh, OK. [laughs]

[music]

**Brady Huggett**

The discussion around brain stimulation therapy was truly invigorating. I felt like I was seeing into the future about what might be possible when brain mapping meets the clinic. The bit I think I'll always remember is Damien talking about driving his children down to see the George Floyd Memorial in Minneapolis. That was the thing that kept popping up in my mind on my

flight home. Thank you, Damien, for allowing me to bring equipment into the institute and for a great talk. OK. This podcast will be archived on [thetransmitter.org](http://thetransmitter.org), where we have also included a transcript.

In the transcript, we've inserted links to some of the people discussed. Check that out. If you'd like more information. This show can be found wherever you get your podcasts, Apple, Spotify, YouTube, or in whatever podcast app that you use. Some of the information for our intro came from the website for Yale New Haven Hospital. If you'd like to comment on this show or whatever we do with *The Transmitter*, you can find us on the social media platforms X, Mastodon, Bluesky, and LinkedIn. Our theme song was written and performed by Chris Collinwood. Thank you for listening to "Synaptic."

[music]

**Damien Fair**

How does it work?

**Brady Huggett**

We take a couple original photos, and then we just give them to this artist who does all of them.

---

Subscribe to "[Synaptic](#)" and listen to new episodes on the first of every month.