Brain Stories Ep7. Benedetto de Martino

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**SPEAKERS**

Caswell Barry, Selina Wray, Benedetto de Martino

**Selina Wray** 00:01

Hello and welcome to brain stories. I'm Celina Ray, and I'm here with my co host Caswell Berry.

**Caswell Barry** 00:08

On brain stories, we aim to provide a behind the scenes profile of the latest and greatest work in neuroscience, highlighting the stories and the scientists who are making the field Tink,

**Selina Wray** 00:18

we don't just ask about the science, we ask about how the scientist got to where they are today, and where they think their field is going in the future.

**Caswell Barry** 00:26

Today, we're lucky to be joined by Ben So DiMartino and so Dr. Martino is a cognitive neuroscientist who works in the field of decision making neuro economics, originally from Italy did his PhD at UCL, where he began to study human decision making and he integrated economic models with tools for cognitive neuroscience with the aim of developing a more realistic account of economic behaviour. In 2008, he was awarded welcome postdoctoral fellowship, that was with Daniel Kahneman has mentor and he worked for two years at the Department of Economics at Caltech with Colin Carrera. And now he's back at the Institute of cognitive neuroscience, where he is a group leader of the decision making group. And so Hello, thanks for joining us.

**Benedetto de Martino** 01:12

Hello, hello, everybody. Thanks for inviting me, it's a pleasure.

**Caswell Barry** 01:17

So we normally start by asking you to sort of give us an overview of what you're working on, or maybe to tell us about how you got into this field, because I know that you've got a story you've been itching to tell us. So I'm gonna let you do that first.

**Benedetto de Martino** 01:30

Yeah, first of all, I think he, you will immediately detect, from my accent, I'm from Italy. And yeah, I lived here for 16 years or more, I'm almost 20, and my accent hasn't gone. That's probably the biggest mystery of neuroscience. And so when I actually studied Molecular Biology at the University, my background is quite different. And I've been changing often. And this is always been a constant of my life. My scientific life always been switching to amongst different fields, and events, eventually, I landed my PhD in human cognitive neuroscience riskware, where I, as often happens with the PhD, you just end up in a topic that you haven't really talked massively about. So I was I remember at the time studying attention. I wasn't really interested much in this topic, I can remember one summer watching the movie with the beautiful mind that there was the biography of John Nash. And being very fascinated by the story, very nice movie, I mean, I won't spoil it. But there are some nice surprises in that movie. And that is the story of these mathematician that eventually got the Nobel Prize for economics. So then after that, I just read his biography. And while I was on doing it, I have the tendency of going to rabbit hole when I found something he was interested in, I started to look more and more. And I went on the website, the novel Academy, and I kind of bumped into biography of Daniel Kahneman that because of my study, I didn't know he was. And he ended up to be a psychologist that won a Nobel Prize for economics. So that was very interesting and fascinating. And then I discovered this phenomenon of the framing effect. And I realised there was a very common effect is the fact that that often just reframing an option, he completely changed the decision in a very systematic way. And because was so common, I was really surprised

**Caswell Barry** 03:35

by example. Yeah, just for people who don't know what it is. Yeah,

**Benedetto de Martino** 03:37

I mean, I can give you many examples, but the one I like often to do is imagine that you are on a diet and you go to the supermarket, and you see, I don't know some meat and they say 70%, fat free, that sounds very appealing that piece of meat. But if you were reading 30%, full fat, you probably don't buy tea is very remarkable, and the fact that they human, and I mean, this example is very toy one, but there are a systematic aspect in this decision, in the sense that often when option of framing it in a positive gain, in a game domain, people tend to be what they call the risk adverse and then when it's framed the same option in a negative domain, people start to risk seeking. So the interesting things it is happening is very systematic, and it seems to affect everybody and no matter how expert you are the fascinating things that they prove they also medical doctor, they with many years of experience, if the patient case was described with the notes of mortality, they were making one decision if it wasn't described, the notes of Survivor rate was making a very different decision. So I decided to study that then the neural basis of that and and there was one situation in which my supervisor wasn't very happy. I was Gonna move from. So he told me I could do that during my free time. And if you've done a PhD, you realise there isn't much free time there. But nevertheless, I was so fascinated by this topic that I throw myself into it and they throw myself with the naive ness of somebody that doesn't know anything. And probably that helped me because those framing effects have always been studied between subjects means you asked to one group one question, one group another question. And they thought if you ask that, but that are not really good to study fMRI because for fMRI, we need an effect that we call within subjects. So means asking the same question that one person over and over again. And because we need data, we need to repeat this question so many times, that everybody in the field, they knew the topic better than me, they knew that wouldn't be possible, if you keep asking some question people would realise. And because I was kind of naive, I just come up with a different way to ask this question. And the story goes that we published this paper. It was one of these a study it was fantastic in which you predict some things we predict the involvement of amygdala in this effect. And I can explain elaborate more at the end. But we found the subtle what we, we were predicting things almost never happened in science. And then we wrote a report, we publish it, and as I told you watch the movie in summer, by spring of the year after was published in, in a very, like, large journal. And and then a few months after I got an email from Kahneman himself, congratulating with me about the study, and saying that the way I came up to elicit this framing upset was the most simple but nevertheless, they always missed it. Because they you know, they were, were they were overthinking too much the problem. And then he also said he was gonna meet me for a coffee long on that. Imagine you're a PhD student in your first years. And you get an email from a Nobel Prize winner, a meal shake and thing. And since then I interact with him quite a bit. And yeah, and then the rest is history. I don't know. That's amazing.

**Selina Wray** 07:21

That's an amazing story. I can't imagine like your heart must have jumped 2 million beats when you saw that email pop.

**Benedetto de Martino** 07:30

Yeah, I remember I booked on holiday at the time it was coming along and I cancelled it. Because it was like his wife, there is a very famous psychologist was unfortunately, she passed away a few years ago. And it Riesman was receiving an honorary she's English. She was English and she was receiving an honorary price in long and he was accompanying and he visited with and I remember every conversation I had that we can have another really strange thing because he wanted to be called Danny. And that was making me feel really really strange to write an email Dr. Danny to Nobel Prize winner but apparently this his name he goes with with people, you know. And every time I had a conversation with him, I needed the nap after because there were so intense. There wasn't chit chat going on. You know, it wasn't just our you and think it was just like why you did that? Why this this thing? And is, no matter his age, his mind is so sharp. That was super, super challenging. And another thing is that Danny used to do that I found it very stressful that one of them was telling him something. It wasn't say Oh, yes. No, it was like, Let me think. And then there was like three minutes of silence, in which I was totally embarrassed in which he was thinking and then often he was like, I disagree. And then he was like, oh, but it was a very, very good training for a PhD student. Yeah,

**Caswell Barry** 08:57

this sounds like the you know, this sounds like a dream PhD, almost like a Hollywood conception of a PhD and I should add to UCL or PhDs the lens. Yeah. How did you how did your background in molecular biology set you up for that? I mean, this is, this is almost nightmares, right? You go from one field, which you thought you understood to being grilled on the spot by Nobel Prize winner who pauses for three minutes.

**Benedetto de Martino** 09:22

By economics. I mean, it was already my second jump, because first jump moving from as everybody knows, molecular biology, cognitive neuroscience are pretty far away. And then from cognitive neuroscience to economics, and never took on a course of psychologist. I mean, one thing made me feel better when I think I've read in an interview of Kahneman, they never took a single class of economics and he got a Nobel Prize in economics. So this is something they make for the student they're listening to us is really important. Don't get too much yourself stuck into a box because you have done certain thing you need to do all those other things. I mean, as well, to answer your question, The move came mostly from the fact that I was completely useless with my hands in a Mullah in a wet lab. And everybody was telling me but I was just being super stubborn and just say, No, I can do it. I'm very, very clumsy as person. And as you know, because you know you some of these kind of delegate hand procedure, they're really difficult if you're like this. And the luck was that the welcome programme, they joined because I was determined to carry on doing that, in fact, I joined this PhD because my plan was to join the lab of cloudier stern in UCL and doing developmental neurobiology. But then after the my programme, there was a welcome Ph. D. programme there, unfortunately, now is shut down. But it was one of the best programme in the count, forcing you to do a rotation between three different lab and they were forcing you that the lab shouldn't overlapping in team. So I, I put one rotation in this cognitive lab, mostly because I was so different. That was fun for three months to see. And then I realised after being three months in kloudio, lab, but that was great. By I was spending all my night opening, like chicken eggs and breaking yolk. And when my clumsy and I mean, I actually have done a little stand up comedy in which I talk about that. And a few funny story there as well.

**Caswell Barry** 11:36

It reminds me of a story of a no another Nobel Prize winner, people who joined Johnny Keith's lab, allegedly at one point, he would ask them to stand there with their hand flat and look to see if it shook. And if they did, he was like, you'll never be able to make tetrode. Yeah, but

**Benedetto de Martino** 11:50

but that's, that is one thing that I think there is a lesson in there. And the lesson in there is, you can't be good at everything. And you sometime you need to negotiate between what you like and your ability, I think I would have been a very unsuccessful and frustrated PhD student in a molecular biology lab. While when I switch that to the things, I was much more happy. And so I think one important lesson here is when you're young, look yourself in the mirror and trying to negotiate what you like, and what things you're good at it. Because there are some things you might be more better at it and, and you should work on those one as well. I mean, doesn't mean you don't need to improve things, you're not good at it. But there is no point to be massively stubborn on something. And economics actually came to the fact that that deeply down immediate was always the feeling that I wanted to do humanities with the scientific tools. And that was really my biggest since I was in high school, I was a very pretentious young boy reading philosophy, anti nobody at the time, I wasn't very good at maths, because I found that the way they teach maths is extremely boring was just like, like parcel like doing exercise. But I really liked big question. But also, I like the rigour of science to address this big question. And I could find in this combination, there could like investigate the person the matter for society, but with some more like, accurate tool, maybe using scientific method.

**Selina Wray** 13:32

I think it's a really important lesson. And I think as you've outlined, how valuable these schemes are with rotations, because you don't know until you have an opportunity to try it either what you will be good and maybe, you know, when someone expected talents mined by, so you published this paper in your PhD, you got in contact with this Nobel Prize winner, and then what

**Benedetto de Martino** 13:56

was wrong? What is the trajectory? That was I always say that that was my first paper and it was published in Science. And the people just say, Oh, that's great. The reality because I also studied this phenomena is called a reference point. He said the worst possible reference point that you expect that certain type of thing and life there is going to be just a long chain of disappointment. I'm joking i after they pay, but I think I could convince my PhD advisor the topic was worthwhile to investigate. And I carried on working in the area of research. So at the time, now Marxist agenda has changed a bit. By the time I was very much interested. I found it that that the oldest programme that was initiated by Kahneman and Tversky, about bias in decision making. While it was really cool, it felt a bit like a zoo of curiosity, right. So you're on one side that is a rational model of economics. They make a very strict assumption is very consistent, but it doesn't match a lot of behaviour. And then on the other side, you had a lot of strange behaviour that you call with all different names, Endowment Effect, framing effect, sunk cost, there was this kind of a collection of anomalies. And that was because again, I think see you bring with you certainly because of my, my training in more like hard science was very unsatisfactory that because he felt like, you know, maybe if you're a purely a psychologist, that's fine, you know, you're describing this behaviour, but I wanted a unifying framework that did make those things rather than being anomaly being like a window on a deeper process that we are missing. And so my aim there was trying to use this one as a window into and the main team was, look, a lot of these things, they looks like a bias, because we are putting people in this very strange situation, but the human brain has evolved to solve other type of problem. And this actually is very well optimised for that. So they're the I think, if you could just summarise the theme of my research at that time was look, rather than their mistakes, or feature of the behaviour is not just like, some kind of like people being stupid and just be not very attentive and just making this mistake. And the new Roy is a good support to that. Because if you have an entire neural system dedicated, and then producing that effect is very unlikely. And and then it was he can also be proven in other way, but that was the idea.

**Caswell Barry** 16:48

So as the implication things I see you name a few things like the framing, effect, sunk costs, other beneficial side effects those then is that what you're saying that there's a reason why you should stick to something, or?

**Benedetto de Martino** 16:59

Yeah, very much so. And I think now that we know that, because first, this is, for example, a limitation of economics didn't really think that there is multiple value system, there is always the economics almost feels that there is this kind of what we call now neuroscience, a model based system. And that's everything. But we know that evolution has endowed us with very other different types of value system and one of these is the Pavlovian system. And the procurement system is a system in which you don't really need to learn the value, you know, just a baby doesn't need to learn the milk is as I value, and loud noise of low value, these are like hardwired in your gene. Now, this system is useful to humans as well, it's very unflexible. But because it doesn't need the learning because you know, there are things you can't really learn by experience, you can really learn the jumping from, from a building is bad, through simple reinforcement learning because you can do just once and then the learning is ended. So you want a system that really like tells you approach reward and avoid threat. And what we prove the widows line of research was those framing effect cams to the fact that while you're computing the value with all your high level system, you still have these very basic mechanism of just say go for, for the reward and avoid the threat. And, and this kicks in and interfere with the other system and gives you a behaviour that looks really strange. But in reality, you don't want to take it off that system. We for example found that people affected by Otis, they tend to be much more consistent in this type of decision. So if this is only the standard to measure the quiet but we know that those people that comes to a price in other aspects of their life, their inability to adapt their decision to the context. So I think the mistake was to set the bar on the theory the mistake and then call it everything was falling outside the theory as irrational as a bias as a mistake. without really understanding why those behaviour were re arising. Yeah.

**Selina Wray** 19:25

And so can you tell us a little bit about what your lab is working on now and how like what are the most exciting questions in your area at the moment?

**Benedetto de Martino** 19:34

Yeah. So I did I went through so I I've also Yeah, one other aspect so so the first things I was saying just to finish that things about watching the movie of a beautiful man No no no i is linked still on the entries when it when you're looking for for question often talk to my student and think you know when I say just where question came from question often don't have Keep rereading the most specialised articles in your field, if they came from, sometimes they say read Madame Bovary, you might can't like, in particular, if you have the luck that your field of knowledge is trying to understand humans, what better playground, then stories to understand human. So get inspiration from everywhere. But because of this, the the flip side of me being like these get curious by many, many different things all the time. And it's an honour device, because I'm parently science rather prefer having one person does one thing for all his life, then just keep changing. But I one point I started, I think with another normally this course in your programme, a very good friend of mine, see Fleming, we started to have this very interesting conversation about confidence into value. So that was a another big team in my lab, with done in collaboration with Steve that is exceptional, is an exceptional scientist and also an exceptional person to work with. We, we started to investigate our match of insight you have into this decision process. And that was a been a big a big team, because we really, from my perspective, from more economics perspective, and then there's also another things if you interact with economists, you start to think in a slightly different way. Remember, you're never going to become an expert to everything, but you will have a friends that are experts in this thing. So so when I have a question of economics, I just send an email to Pietro Andrea there to colleague of mine, that professor of economics in Princeton, and in Bologna, and I just asked their advice and take. And since then, the most recent things has been keeping me awake and thinking a lot about this problem, as been a lot of work in we have done a lot of work also at boundary with artificial intelligence, I know it's a topic is dear to Castle and take. And, and we got to like some grant from Google DeepMind and things to study, this fundamental problem that most of these approach are very powerful, but they require that you always keep this very simple numerical reward at the end of somethings in order to learn even this very sophisticated system, they always need to add a number a point. And I just realised that that is in a way happening. Also, in all these experiments were making, we always have this simple numerical reward that the UI at the end of an action you get 5.3 dollar. But this is not a life doesn't have a tag or label. So when I make a decision in the world is not like that. Just I grabbed these and they just some things pop up just you want them point, well done. So my question is how we navigate in a world in which we need to learn value, but value is something that got to be constructed by us as well. So there is this idea that something is anointed. So I felt that the field has been too much focusing in equating value to this a Donek reward. But what I'm actually now interested in understanding is more like value as a concept, as a concept to achieve a goal. So for example, I is ready you can see by if I have like, I don't know a telephone as value as a telephone by Imagine I got stuck in this room, and I need to break the glass. Now the value of this phone will be how hard they say Tim breaking. So I'm very much interested in understanding how this constructive aspect of value happens. That's by no means easy, is very difficult.

**Selina Wray** 23:54

And could I ask him, please bear in mind that I'm a molecular neuroscience, a molecular biologist, I have a steady hand. I did the test, as we were talking about earlier. And so forgive me for clumsy phrasing. But how is value shaped by things like risk involved? Or how hard you have to work work to achieve something of value? Does that factor in today? Yeah,

**Benedetto de Martino** 24:20

I mean, he does. But we need to understand before algorithmically. And this is an award. It's very important to me, algorithmically out. What is value in the first place? I think we still have fairly confused about the whole thing. And the reason why I'm saying algorithmically, is because I found again, probably because coming from molecular biology myself and I found one thing when I came into this field very unsatisfactory. When people were saying this region is involved with theory of mind, I always wonder how a new runner that is involved look like, like Hello, I'm really involved. So That kind of very superficial type of description felt always incredibly unsatisfactory. There is a region in the brain we all know is involved we value computation, it's called ventromedial prefrontal cortex, by really would like to know what algorithm they are instantiating those bunch of neuron. And then as you are saying, into value, value is a very strange object, because it's something that doesn't exist outside in the external world. By also you, you talk to the external world with it. And so there are all these like internal aspects, like your sense of risk and things, they should contribute to it. I often do an example in my lecture, I show up in a painting, asking how people value that painting. And often it's a nice painting with a mum with a little baby. And you know, quite a lot few people, they think they value it. And then I asked how much you value them if you would sell this painting and you know, some people think is, it will sell for a lot of other say, is nice by my no sell for a lot. And then I show that painting was painted by the other fitler. And then just giving these a little a little bit of information, there is a gigantic remapping of this value. Now that painting first doesn't seem so cute anymore. And second, you realise they will sell for a fortune. So that's one aspect of value that doesn't seem to be in any other domain of neuroscience, in which a teensy bit of information can completely re rearrange it. In perception, everything is much more stable. You can't really rearrange gigantically perceptual representation as you can do with the value of presentation.

**Caswell Barry** 26:46

I've heard you and so I imagined something related to this this thing I've heard you talk about before, I've heard you talk about sort of economic bubbles and how you can even as in things where you've got like, the famous tulip bulbs, where the the value of cheap tulip bulbs just went up because more people wanted them. And there was almost sort of a self fulfilling or a feedback cycle of some sort. Yes. Is that true? Is that? Is that something? You can? Is that something we may

**Benedetto de Martino** 27:12

identify? Yeah, I think I think yeah, that's a good example. And they didn't come to me before that. I think it's also a good example to the question that some one of you were asking me about the fact that that could be advantages some things. So there is this phenomenon, then Carswell say that is happening over over again, in financial markets, but then suddenly, an asset got crazily. And the reason why we talked about to the bubble, because it was one of the first example that was recorded that way on record. And they got to a point that the tulip bulb was the value of an ounce in Amsterdam, it was a specific type of dilbar know, everybody, every tulip bulb, but in then in matter of few weeks, the price collapses. And then as keeping going on without bubble and so on. And recently, we still don't know, the problem is see take Bitcoin people ask me is Bitcoin a bubble I, the problem is with bubble, you don't know their bubble until the crash, because things could be genuinely have changed value, right? The low electricity couldn't be a bubble, because we all need electricity. So the value of electricity has gone up and is for a good reason. Same thing with a computer. So Bitcoin could be a bubble could not be a bubble, if this is going to be the currency that replace everything. But the interesting things that another guy that actually happened to be the guy that won the Nobel Prize with Kahneman, it was called Vernon Smith proved that even in a controlled setting, like a lab in which you make people trading asset, that you know, the price every now and then for unexplicable reason those prices start to inflate. So you generate this bubble, and in that case, you can tell is a bubble because you know, the fundamental value and you know that these things is corrupting on the top of the fundamental bar. So we did an experiment, it was one of the most difficult and tedious experiment ever made, and we'll never made it again to try and to just test what was happening in the head of people when they were like trading in this bubble context. And now our main finding was first Yes, there was an inflation of value representation, but the cool things was that we found a very interesting behavioural correlation that we would never have found that without the neural link. So this is also another good point as often in order to understand a purely behavioural mechanism, the neural signal can actually point you in the right direction. We found that that there was a very strong correlation has nothing to do with behaviour but was inspired by see certain type of signal in the brain between theory of mind and susceptibility to ride these bubbles. We found something surprising that theory of mind for people that never heard of it is the ability that allows us to put ourselves in the shoes of somebody else. Right? So it's a very good ability. But what we found was that people have a high theory of mind that when inflating the price small, and what we speculated was that those people rather than concentrating on the objective value of the asset, were actually integrating in their value representation. While other people were, were maybe thinking so just say, I know, this is not very valuable. But I think that coswell will think this is very valuable. Therefore, I think I'm better off buying because Caswell is going to buy from me. So you have a paradoxical situation in which theory of mind is one of most adaptive aspects of our brain, but then in my put us in danger to be susceptible to these bubbles situation when you are working in a financing environment, okay, then you can say, okay, let's put as a tray that people have no theory of mind is not even a solution that because then there is other study that shows that if there are inside the trader, in those market, people will tell you mind are better to spot them. So there isn't a solution that fits every problem. But we got to understand those mechanisms. So I don't know. Was it clear? I mean, this is a very technical things I tried to cap the word like

**Caswell Barry** 31:36

fascinate, totally fascinating. Actually, I had no idea about this. I just keep thinking of what's the what's the film with blue horseshoe lives and steal the famous 80s.

**Benedetto de Martino** 31:48

Yeah, like a Wolf of Wall.

**Caswell Barry** 31:52

That's one of those terror. Okay, this is a terrible anecdote. Sorry, I should, shouldn't be quietly talking about. So maybe we should sort of direct things forwards a bit. So what So what do you think the future of this is? I mean, it seems that this field has many directions it could go in. And indeed, there would be, you know, many industries interested in the sorts of, you know, the sorts of biases, how you might manage them in humans. Like what's, you know, what's next? What's the next big thing?

**Benedetto de Martino** 32:21

I think I think a good way to answer this question is, what are the lesson I've learned in those years doing that? So first lesson was a lesson kind of on already wanted me when I was very young by as a young people, do I ignore them? And these are device and they say, I was saying, Look, if we show this mechanism, we can convince economists that you know, some of these I and they say very cynically, I couldn't convince them for like 20 years, you won't be able to. However, besides the cynical thing, that there is some truth, and also, some not so true things because first of all, Kahneman won a Nobel Prize for Economics, this is a sign it by economists. And more recently, there was Richard Taylor, there was a person on worker we cannot monitor again when on on the number pressed economy. So it's not true that economists are so insular to this new idea. But what economists don't like and now I can start to understand why they don't like that. They don't like if you throw away one theory and you replace with nothing. So we should do our homework, be more, and use this knowledge to build the theory that they can use, because you can't just simply throw in the been expected utility theory replaced with a plethora of bias. There are no psychologist they need to make a decision about how to change the interest rate and things. So they need the theory. So first, that action more theory, and more theory informed by the data, they often say that reproducible reproducibility crisis comes from mistake in the analysis and experiment, in my opinion comes from lack of theory, because when you have a solid theory behind things or more a product, there is easier, I can pronounce that word that be able to be reproduced more easily. So the other things that I think another really interesting avenue for so this is for the interaction with the economist, the second things was like, I also learned the lesson that those very complicated experiments like the one of the financial bubble, they they are interesting, but they don't make anybody because economists found them too simple. And neuroscientists find them too complex. And everybody say interdisciplinary is great, but then trying to do it, and you'll find trouble on both side. So my advice as well is you can be as interdisciplinary as you want, but you need to decide which is the field in which establish yourself and be a leader in that field and then talk with other one second, I mean, the third thing is is like talk With Friends, I mean, talk with people they know rather than assume you can know everything anymore in general, where the field is going. I mean, at the moment that there is a frenzy about artificial intelligence and all these things, and I think it's very promising. But we got to get serious in answering these big question of how the brain, I mean, we can converge to the same solution from very different aspects. And we are really need to figure it out how the brain learn with so little example, other brain built his own value, schedule. These are all questions that are still unanswered. And, you know, I feel that that's a really fruitful area of research. Yeah. But yeah, it's called doing interdisciplinary research and is, and is cool to find connection in things. They are not the one you normally read in the paper that you normally read. So it's good to read everything. Yeah, let's talk for a second, something I think is important, and I care a lot. And often people, you know, talk on Twitter about life balance and things, I think, for me is is stupid in the first place that this should be a question, of course, your work is not your life. And you should have a lot of interest in OB, and you should work, just the amount that you feel towards it. And my point is even stronger than that is that is from your own, because you know, you're a human being. And I never think that I am a neuroscientist, I do neuroscience, but I do a lot of other things. So I have a lot of a hobby. And I would encourage everybody to have a hobby, I found that sometimes very frustrating when asked a student which, which are your hobbies, and I just hear like watching movie or reading I mean, that is all human being should do that, but then find out the thing, but I think it will benefit your science, it will benefit your science because the worst mistake we can do, as in the example of the curse of knowledge is just getting really stuck recursively in a topic, and not seeing anything outside. You know, now I'm reading a book about genetic, copper population and, you know, reading the items, having some ideas, that seems completely crazy at the moment. But God knows, maybe there is something in there. And I think if you don't live a balanced life, in particular, if you want to study how the brain works, and you don't let your brain live a normal life, that will be very bad. Yeah. And so I think if I can just because you told me that a lot of students hear this podcast, there is no pride in saying that. You don't leave your work all the time. You just shows how shallow you are as a person. If it's like that, then the and

**Selina Wray** 37:58

I love that. I think that's actually of all the episodes we've recorded. This has been one of the most inspiring just hearing how your career is shaped. And actually the willingness to admit when something that you really thought you wanted to do was not right, the ability to be flexible. And I you know, I completely agree that life is too short to work the whole time. Let's enjoy all of it and everything that life has to offer. So thank you so much for joining us. We're almost at the end of the interview now. But we have one question that we ask all of our guests, which is could you tell us your favourite fact about the brain or something unusual about the brain that you find really fascinating? Yeah,

**Benedetto de Martino** 38:44

so you mentioned me that you were gonna ask this question made me think quite a bit. And there are a lot of interesting facts then. But the one I pick the Siemens has nothing to do with the discussion we had today. One thing that really was always kind of a part for me is this this fact so that we didn't have time to talk about that, but we really believe in neuroscience, that the brain is a Bayesian machine. That means the integrate multiple evidence and multiple beliefs and update according to their uncertainty and so on. If you've never heard about that is a fascinating thing. You should definitely go and check it out. But then it was always something that always bothered me. And the fact that when you're looking this by stop by stable perception now you might have seen those one in which could be a rabbit and a duck. It seems your brain is incapable to maintain those Billy together. That goes completely against the idea that you know, you maintain beliefs and update them. It seems your brain instead is much, much more. Somebody does hypothesis testing. You just see the fact that the brain brain scanning the brain is so powerful, it's so flexible is so everything and then He can only entertain one hypothesis at the time about the world. To me is fascinating. I don't know why I can easily imagine a machine that can entertain more than one hypothesis at the time. But I don't understand what is this big constraint that stuck our brain to leave in one single iPod, this is the time and the fact that we know it, that doesn't help at all. And in a way this is linked with those buyers because also in those high level cognitive bias, the fact you know that you have a framing effect. It doesn't protect you from having it and they feel to the same things. The fact you know that there is a rabbit doesn't know you to say. And this for me is just bizarre, fascinating, and I don't have an answer for that. And I would like to know the answer you know, before I kick the bucket

**Caswell Barry** 40:57

that's fantastic. Thank you so much. That's I've got to agree with Selena. This has been utterly fascinating. And I don't think there was even a banjo I don't imagine. I haven't felt so inadequate. I need to sleep more apparently. So that was a fantastic discussion. Thank you for another say for joining us on this episode of brain stories. See you all next time. We'd like to thank Matt Wakelin as appear drummer smart their roles in taking brain stories from an idea to a fully fledged podcast. Follow us on Twitter at UCL brain stores for updates and information about the exciting forthcoming episodes.