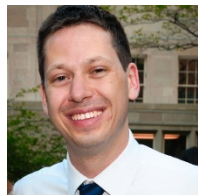## Q&A with Dr. John Meixner, JD, PhD
Conducted by Dr. Francis Shen, October 2020

Dr. John Meixner, JD, PhD

Assistant United States Attorney, Major Crimes Unit
United States Attorney's Office, Eastern District of Michigan

TRANSCRIPT:

Dr. Shen: Welcome. It's my great pleasure to speak today with Dr. John Meixner, JD, PhD, and this is, to remind everyone, part of an upcoming session at the International Neuroethics Society annual meeting called Policing Neurotechnology and the Search for Truth. If you're looking at this before the session on October 23, please come join us for the live session where we'll discuss this work and the work of many others. If you're listening to the recording after October 23, check out the session and all that was discussed. We'll talk with Dr. Meixner about his work and learn more about where I think it's headed. So, welcome so much for joining us. Can you please just give our audience a sense of your affiliations and roles and the path that you're leading right now?

Dr. Meixner: Yeah. Thanks, Francis. Thanks for having me. It's really exciting, seems like a great panel. So I'll try to be short on this because my path into the field was a little bit strange, but it was a very serendipitous turn that led me into this kind of work. I was applying to PhD programs, mostly in psychology and neuroscience in sort of learning and memory sort of fields, and I happened to interview at Northwestern with Peter Rosenfeld's group, which is sort of one of the main groups studying the concealed information tests and P300 and things like that, and just fell in love with the work right away and decided I wanted to go there for school. And also very fortunate for me, they happen to have a JD, PhD program because I knew I was interested both in the science of it and also in sort of how brain-based memory detection could be used in the real world and how we interact with legal principles and things like that. So I started working in the Rosenfeld lab, and I kind of had a few different core focuses and we can dive deeper if you want to on some of these. I was interested, mostly in forming more realistic versions of how to do a concealed information test, and I should back up for a minute and just kind of describe what a CIT is and how it differs from other kinds of sort of lie detection that people talk about. The concealed information test ("CIT") is designed basically to detect whether somebody recognizes a piece of information that's meaningful to them amongst a list of other irrelevant things. So, for example, if there was a murder committed using a .38 caliber handgun, you could show a suspect a list of different weapons like a .38 caliber handgun and a shotgun and other kinds of pistols, things like that, and the idea is that when the person sees the item that's meaningful to them — if they know which gun they used to commit the crime — that will stand out to them and you can measure that in one of a number of different ways. You can do it using sort of autonomic polygraph methods like measuring skin conductance or sweating at the palms. At the Rosenfeld lab, we use something called P300, which is a particular sort of event-related potential, which is a summation of signals from the brain that arises up at the scalp so you can identify when people

recognize things that are particularly meaningful to them, and that's important. It's very different from kind of traditional lie detection tests which try to sort of detect similar types of responses, but not between things that are recognized or not recognized, but instead between statements as to whether or not they are truth or lies and for a number of different reasons. The concealed information tests — the memory detection kind of tests — are more accurate; they're formed on a more scientific basis and that the control items are actually good controls which is not the case in lie detection, so that kind of research had been going on for a long time since before I came into the lab — since the early 90s, that's when things all sort of really kicked off in that area. One of the big problems that I think still persists is almost all the studies in concealed information tests — both neuroscience-based, P300 and ANS-based — it all tended to have these sort of unrealistic scenario, so some of the tests just used to lists of items that someone would come into the lab and look at a list. The researchers would say, "memorize or think about these different items," and then they would test: can I detect that someone recognizes in the CIT the item that I studied earlier, not very similar to what you might think of is a real crime sort of paradigm or something like that. So I tried to do work that, as best as possible kind of mimicked actually learned information in the real world, and one of my favorite studies I think I had in the lab was a study where I had someone or different subjects wear recording camera kind of similar to the body cameras that police officers wear now. They went out and recorded their daily lives. I didn't tell them to do anything in particular, they just wandered around in their normal life and came back, and then I studied the footage, and I identified different categories of information I wanted to try to detect. So, for example, if they went to the grocery store during the day, I might develop a set of stimuli and ask them, "Okay, which one of these is a place you went yesterday," and it could be grocery store, park, the gym with the idea being, they would recognize the grocery store, the place they had actually gone, and I could detect that recognition using a test. So, things like that are very important to the field because, I think, for it to have any relevance in the future, it's important that we can know that these tests are still accurate and actually helpful, sort of, when you have all the confounding factors of the real world like memory is not being encoded as strongly as they might have a lab context and things like that.

Shen: That's a really great introduction, thank you. I want to get to the implications of your work in a moment, but I also want you to, if you can, speak about another really exciting study that came out of your work and Rosenfeld lab that had to do with mock terrorism study. It caught a lot of attention. Could you describe that study to us? It seems another possible application of this technology is: trying to figure out, before it happens, those who might be plotting something. Could you say a little bit more about that study, its origins, and how you carried it out?

Meixner: Yeah, absolutely. I think that's also an important one, as you said, because — we'll get to this in a minute, I think — but there's a lot of pitfalls for whether CITs could actually be used in sort of police interrogation contexts for a lot of different legal reasons. It's important, I think, to do research on whether or not these tests could be useful outside of the courtroom. If they're never admissible and usable in court. So for that test, we had people plan a mock terrorist attack and we gave them this sort of briefing packet where they could pick from one of a bunch of different locations in a city where they could choose to do an attack, and they had to pick a date that we were going to plan it on, and after we had them go through this sort of planning phase, they wrote a little letter to their superior saying, "I've made these choices for these reasons," and then we had them — very similar to the other study — sit down and take a test to

see if we can detect which city they were planning to attack, which sort of month the attack was going to be in, and other details similar to that, and in the same vein, we are able to pretty well detect when they actually recognized the particular month or the particular location. Now, the interesting thing that you mentioned, Francis, is there might be some cases where you want to do what's called a searching CIT sometimes, which is: I know, for example, "this person is associated with this group of individuals planning something, but I don't know where an attack is going to occur." That's more difficult because the statistical comparisons you can make aren't as easy when you don't know which of, for example, six different items you present to the someone is the relevant item, and it's a little bit harder, but we were able to detect with about 60% accuracy– we could pick out 60% of the time which one of a sort of list of items was the one that the person had been planning out their events in.

Shen: Of course, this raises questions about its use in the real world, and you've talked about this a couple of times already. I'm wondering if we can move in that direction. First of all, I have two questions related that you can, I think, answer in combination. One, has any of your technology already been used in real world investigations and/or have you been– has anyone inquired about doing that, and what looking ahead, you know, what are the necessary research steps that you see as essential before potential application in the field happens?

Meixner: Yeah, a pretty short answer to the first one. No one has used at least our variant or our group's variant of the CIT in any sort of legal proceeding, and to my knowledge, I don't think any law enforcement has really been using it. There's a sort of very similar type of test which some of our listeners might be familiar with — brain fingerprinting, which is popularized by Lawrence Farwell, has some issues with it, but it's the same kind of concept, the same basic idea that you're detecting a P300 ERP evoked by recognition to something meaningful. Dr. Farwell's marketed that and gotten some small use here and there, but the short answer is: there's not a whole lot of interest. That's for a few reasons. Number one, no one knows if this could actually be used in courts, if it would be admissible. Probably not at this point, would be my conclusion. And the second is: it's a little bit less useful than sort of a more traditional polygraph test from what police tend to use it for in their investigative purposes, which is using it as part of a sort of broader interrogation package where they're trying to discuss, you know, elements of the crime with the individual they're testing, so I think it's going to be a while– I think there's a lot of work to be done before it becomes a really useful tool, but what is great about it is it doesn't have some of the same false positive issues that true lie detectors do, and it could really, in the long run, I think, be a much more effective tool, but go ahead. Sorry.

Shen: Well, I was just– on that, you know, the challenges that he faces. One of the ones, and I know your lab and your work have looked at this, is countermeasures. That is, are there things that the person who is wearing the EEG skullcap could do so that, even though it seems like they're being compliant and following all of the researcher's or investigator's instructions. In fact, they're doing something maybe as simple as biting their tongue or more complicated thinking about something that would fool the system into believing they either recognized or didn't recognize depending on what they want the researcher to see. Could you address that? How much of a concern is that, and is it a concern that can be addressed through modifications, either through the technology to its application?

Meixner: Yeah, it is a concern. I think the general literature shows that the ERP or neuroscience-based tests are a little bit less vulnerable to countermeasures than most of the polygraph or ANS-based ones are, but they are, for the most part, still vulnerable to somebody who is well trained. It's not, I don't think, the biggest concern for a couple different reasons. One is if you can set a test where, you know the way you do your stats that it's very, very, very unlikely you're going to get a false positive, even if, say, you know, a small subset of your actual recognizing people are doing countermeasures. As long as it's not everyone, you're going to get sort of a sample or if you have a hit you are very, very confident that's a true recognition, and you're not worried about a false positive, so there's still some use there, even if you know some very sophisticated countermeasure users can still beat it. There are ways you can also detect countermeasure use. So usually the test involves some sort of input — like you have to press a button when you see the stimulus appear on the screen — and a lot of times those inputs will be slowed down when someone's doing countermeasures or there's other ways to detect that, but it's, I think, it's a concern, but far less of a concern than some of the sort of more large legal issues that I think are facing the tests, and I'm sure you wanted to get into that, so maybe I could touch on a couple of those.

Shen: I do. I want to ask one more question on the science and then jump right to the legal issues. The other question on the science is just about the mechanics of how this might work in practice, and I have a couple of related questions. So, as I understand it — and you know we've talked about this before — the recognition is simply a recognition that the brain has seen this– there's some salience to the thing that's being presented to the brain, but we don't know why it's salient. That is, we don't know necessarily it's salient, you see a picture and it's recognized because this is the person that the interviewee or the defendant just killed or this is the person they take care of, that they found the body of moments after the person had been killed. There could be information contamination — I know that's something that the research has thought about — that is, the reason you see this is because you saw it on the news, not because you were the perpetrator, and then just some crimes, it would seem, there might not be a lot of unique information that only the criminal and the offender knows just because the nature of the crime, so I'm wondering if you could just say, before we get to the legal stuff, what sorts of cases do you imagine this sort of technology being useful, what sort of fact patterns, and how do you guard against some of those concerns that well, how useful will the information be if it's just recognition without more about why it's recognized.

Meixner: Right. I think those are all very, very valid concerns, and I think, you know, people don't often sort of get to this, but in the vast majority of cases, you probably couldn't get much out of a CIT. For example, I work as a criminal prosecutor right now, and I think the vast majority of my cases, it would be– I would be hard pressed to come up with good CIT information that would actually be helpful because we know that they're, you know, involved in a particular house or certain things and you just– there wouldn't be a good use for the CIT. There are some, for example, let me give you one. If you had a bank robbery, and a particular amount of money was stolen or a particular wording was written on a note. These are the kinds of details that unless somebody saw it in the news ahead of time or they were spoiled in some other way, you might be able to develop a CIT for, but it's still– it's a very sensitive sort of thing where you have to first ensure that the person– your suspect actually remembered or noticed those details. That's one big area of concern. Second, that enough time hasn't passed by those memories have

faded. And third, that there's not some other kind of spoiling like, you know, police officers are revealing details of the crime before you gave this kind of test. So, those are all very sensitive things, some of those things are areas of that need to be studied. We don't know that much about how much the passage of time is involved. One of the reasons I wanted to do that video cameras study I was mentioning earlier, is we don't know that much about how well-encoded these memories are in a real crime scenario as compared to these artificial lab scenarios where, you know, a researcher is telling you to go take this item out of the room– very salient, maybe not so much, maybe the robber doesn't remember how much money he stole. So those are the kinds of things that still need to be done in the lab. I think before we know how effective they'll be.

Shen: You've– That's a great point. You've alluded already to a number of the legal issues and let's turn to those now. And let me just open it up to you. This is, you know, at INS we're concerned about the ethical and the legal and the social implications of this technology, so let's just assume for the moment that a lot of these developments move forward, or at least some of them do. What, you know, constitutional or evidentiary or other privacy concerns like– what are some that you see as the major legal or ethical issues in the potential use of this technology?

Meixner: So there are many, and I think they're all serious challenges for the test. So the– I think the most existential one probably is the Fifth Amendment, at least in the United States, which protects individuals against self-incrimination. There's some literature already out there about whether or not the sort of statement that someone makes when they recognize an item on a computer screen, whether that falls in the coverage of the Fifth Amendment. So to put it down to its simplest terms, generally the distinction is between sort of bodily samples that someone takes like a blood sample, which are generally not protected by the Fifth Amendment, versus communicative acts or statements, which are protected. It's a very interesting area for this particular kind of test because it's very borderline, so some CITs, for example, the kind that we did in the Rosenfeld lab, don't require any kind of response at all, so it's not like you even have to press "yes–" or "no, I do/don't recognize that item." It's– as soon as you recognize it, there's no real way to inhibit that particular brain response from recognition, so there's, I think, a lot of argument to be had about whether or not that's a communicative act. It's very different than, for example, a polygraph test where you're saying– or a lie detector test where you're saying yes or no and response to an item, so I think there's a lot of wiggle room. My general sense is: I think courts are going to be very hesitant to allow these kinds of things to be compelled, simply because they're mental, it's different than other sorts of bodily samples like a fluid your draw, even though maybe theoretically, it's got some parallels there. I think there's going to be resistance, just at a sort of more fundamental level to the idea of mind-reading, and so I think it would be important to focus on non-compelled possible uses for the test, which there are a number of– even in criminal contexts, there are a number of cases where those same protections may not be as high. One interesting use, I think, for the test is in competency evaluations, so one not common, but an area that often comes up is an individual defendant will say he's not competent to stand trial, and there's different sort of battery of psychological tests people use to test that. One thing is, the CIT can be used to test whether somebody is feigning memory loss. For example, if a person says, "I can't remember my birthday anymore," you can test that whether or not, at least that data is still recognized by somebody using a CIT, so there are other sort of avenues, I think, it could be used. The second sort of major legal challenge, I think, is admissibility, and there's been a lot written on this, but I think one of the core areas that still

needs to be examined is just having more realistic tests kind of along the lines of what I described earlier and seeing whether you still get useful detection rates out of those, I think before that can be addressed, and then even beyond those sort of formal legal issues, there's just a more sort of epidemic question of whether or not, from a procedural justice perspective, this is the kind of thing we want to do in our courts. People have varying takes on that. I think there is an important distinction to be drawn between whether someone recognizes a particular item and whether someone is actually telling lies or truth during a test. I think, recognizing information is a little bit more akin to whether someone left, you know, DNA in a car, for example, that was stolen in that, like you just said, Francis, you know, the jury might be able to hear that information, and then they have to make their own proper inferences to what it means, so a person might recognize something for a wide variety of reasons. It does not necessarily mean that they committed a crime, and so I think it falls sort of in that more gray area, but there's certainly a lot of just different philosophical challenges to address.

Shen: Yeah, so many, and you've touched on a bunch of them, and the panel will explore even more. Dr. Meixner, this has been fantastic. In closing, I just want to offer you a chance to think about and help our audience think more about the future of both the research and its potential legal application. What should we know about the future of memory detection research and the technology development? What do you see happening? What needs to happen? Where might all this go?

Meixner: Well, I think the biggest thing is more realistic testing of these kinds of scenarios, which is underway from a number of the groups, and I think they'll continue to get more and more accurate. I think it's likely, at some point, you know, these things will be very, very accurate, and we'll be more likely to have to confront some of these issues. For CITs in particular, the bigger issue is just whether or not they're being used, or whether or not law enforcement is interested in using them at all, so I'm hopeful at least, that there'll be some collaboration in the future so that we can at least reach the point of seeing whether these are useful from a scientific perspective and then sort of reaching the questions of whether, how we think they should be used from a more legal perspective.

Shen: What a great set of research agenda for I hope many to follow. Thank you so much. We have been speaking with Dr. John Meixner, who is both a neuroscientist and an Attorney–Assistant United States Attorney in the major crimes unit in the Eastern District of Michigan. Dr. Meixner, I want to thank you for sharing your knowledge and research. I want to encourage everyone to check out our panel and to learn more about memory detection policing and the law. Thanks so much for joining us today.

Meixner: My pleasure. Thank you.