CATSS PODCAST #3: DR. ANDREW OXENHAM (TRANSCRIPT)

NARRATOR: Welcome to a CATSS profile. We are featuring Dr. Andrew Oxenham, scientific co-director of CATSS – the Center for Applied and Translational Sensory Science – at the University of Minnesota.

Dr. Oxenham is a Distinguished McKnight University Professor in the Departments of Psychology and Otolaryngology. He is an expert in human auditory perception and neuroscience. His focus has been on perceptual consequences of hearing loss and on improving sound perception through cochlear implants.

DR. ANDREW OXENHAM: *I was actually born in Boston, in the US, as you probably can't tell from my accent because I left when I was a-year-and-a-half old -- my parents moved back to Europe -- and I grew up mostly in England. And I did all my studies in England, including my PhD with which was at the University of Cambridge in Experimental Psychology.*

After that, I spent two years as a post doc in the Netherlands. And following that, we moved to Boston where I spent a short time at Northeastern University and then set up a lab at MIT where I was for about eight years, in the Research Lab of Electronics there. And in 2006 I moved to Minneapolis – I'm here at the University of Minnesota, where I have been ever since.

NARRATOR: For Dr. Oxenham, his interest in music opened the door to a career in hearing and learning the ways that we perceive sound.

DR. OXENHAM: *Sound was important to me for a long time through music. In fact, a number of people in our field come to it through some area of music. It was an undergraduate research project I did at the time that got me interested in hearing, and that was with the BBC Research Department. They were evaluating what were called "low bit rate codecs." The idea was that the BBC wanted to broadcast CD-quality sound but didn't have the bandwith that was needed to broadcast all of that information, so they needed to reduce the amount of information while maintaining the quality.*

So, a number of groups around the world were looking at ways to reduce the amount of data that was sent while maintaining the quality. Our job at the BBC was to evaluate these different schemes and to come up with a recommendation. And that turned into what is known as MP3, which is the way that's typically used now to code audio. And it's done in a way that analyses how the ear would process sound. And by using that information, essentially

it's reducing the information in a way that the ear doesn't perceive it. And by doing that, you can reduce the amount of data by almost a factor of ten.

NARRATOR: At CATSS, Dr. Oxenham's work focuses on scientific discovery and collaboration with industry partners.

DR. OXENHAM: *My approach has been on fundamental aspects of hearing and also basic aspects of hearing loss – how we measure it, and what the effects of changes in the ear are on perception.*

Working in CATSS has helped me to realize that there's a more applied side, and that we can take our basic knowledge and use it to actually help people with hearing aids and with cochlear implants. CATSS has given me the ability to collaborate with industry partners who are working on these kinds of devices.

At the same time I have a number of terrific colleagues who work on vision. And we've been in a number of discussions on how we can start to tackle these kinds of problems from a multi-sensory viewpoint.

NARRATOR: Multi-sensory research is essential to his work.

DR. OXENHAM: *The multi-sensory component is crucial to understanding communication between humans. We think about speech as something to do with acoustics and hearing. And, that's frankly the way it's been mostly studied. And in the same vein, vision scientists tend to just study vision. But, what's important to remember is we don't only just hear speech, we also see speech when we look at lips. When we are perceiving speech our brain combines that information without us even realizing it.*

NARRATOR: One testing method at CATSS uses a phenomenon we have all encountered in our daily life.

DR. OXENHAM: *What we often talk about is the so-called "cocktail party problem." And that is how is it possible for us to attend to one person speaking when many other people are speaking in the room at the same time. And the acoustic cues that allow us to do that include differences in pitch between one talker and another, differences in location between one talker and another, and differences in the vocal characteristics of each talker.*

So we all have a slightly different vocal tract. That includes the shape of the mouth and the shape of the throat and the nose, and so on. And that changes the quality of the sound that comes out. And it turns out that our brain is able to make use of those differences in order help separate out different people talking at the same time.

NARRATOR: Let's listen to a short audio clip used for this type of testing. In this test, we are simulating the process of how the human ear organizes sound into something we can understand. What you will hear first is the day-to-day noise of a local café. Next you will hear a single talker – our target in this task – speaking to you from one side. Focus on this voice. Then you will hear a second voice enter the scene, causing masking interference of the voice you want to hear. Finally, the person causing the interference will change location. Then you should be able to hear the target talker better. Now let's listen to the clip.

TEST CLIP

NARRATOR: The test you just heard is called spatial release from masking. It is used to test the performance of devices and implants. Dr. Oxenham explains:

DR. OXENHAM: *Spatial release from masking is what happens when you are trying to listen to one person talk and there is something interfering with that – maybe another person talking.*

What we found is that – not surprisingly –if the interferer is moved away in space from the person you are supposed to be listening to, it becomes easier to understand the person. The way that works is we're using both our ears. We're using the interactions between the two ears to figure out where in space different sounds are coming from. And we're using the difference in location between the target – what you want to listen to – and the masker – the interferer – to enable us to better understand the target.

NARRATOR: This type of research is extremely valuable to people who work in hearing loss industries.

DR. OXENHAM: *We often started with conversations with people in industry. Almost all of the major hearing aid and cochlear implant manufacturers have very active research departments. Through our own work, we know some of these people because they've been involved in research themselves and published some interesting articles on the area. So we've often sat down to discuss – we've talked about the work we are currently doing, we've talked about questions they are currently interested in. And through that we converge on questions they find useful from an applications point of view and we also find scientifically interesting from our point of view.*

NARRATOR: The location of CATSS at the University of Minnesota provides additional advantages for Dr. Oxenham's work.

DR. OXENHAM: *We are very fortunate here in Minnesota, in the Twin Cities area, to have a number of companies involved in medical devices here within our region. So we have a number of local contacts. But in addition to that we*

have a number of contacts with companies around the US and, indeed, around the globe.

NARRATOR: This work is important because it monitors the impact of audio on our changing society.

DR. OXENHAM: *Hearing loss is something that comes to most of us as we age. And the US in particular has an aging population, so it is becoming a bigger and bigger problem.*

And in terms of the social and economic impact, that comes from a number of different aspects. The social aspect comes the tendency of people with hearing loss to withdraw from crowded social environments. And that in turn leads to more social isolation. There is increasing research that this social isolation may in turn lead to faster cognitive decline and also unrelated health issues that may come along with increased social isolation.

NARRATOR: For Dr. Oxenham, using the scientific process to make lives better is very rewarding.

DR. OXENHAM: *The scientific process is what makes it fun for me. There are a number of aspects of hearing and communication in general that we just don't understand. We have a number of ideas how it might work and we are able to use facilities like CATSS to run experiments that help us to answer those questions and to test certain ideas as to how it might work.*

And in many cases it is just as much fun to disprove a theory as it is to confirm it. Because, if you disproved it, you have to come up with a new idea and how can we solve this problem now that our old ideas no longer apply.

ANNOUNCER: For more information go to CATSS online; C-A-T-S-S dot UMN dot EDU.

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