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Creative Technologies: A Conversation with Roy Magnuson
by Maureen Russell*

Today I am speaking with Roy Magnuson, Associate Professor Creative Technologies in the School of Music at Illinois State University (ISU). (see Figure 1) His music has been performed throughout the United States and Europe at venues such as the World Saxophone Congress, WASBE, CBDNA, the RED NOTE New Music Festival, and the Robb Composers' Symposium. Magnuson is also the creator of the virtual reality composition software solsticeVR and the conducting software *Ribbons*VR. He is a member of ASCAP, and his music is recorded on Albany Records and NAXOS.

Maureen Russell (MR): Let's start at the beginning. You are an associate professor in the Creative Technologies program. What is the Creative Technologies program?

Roy Magnuson (RM): My locus of tenure and my area, the school that I'm in, is the School of Music. My whole background is in composition; I have a doctorate in music composition. I primarily teach music theory, aural skills, composition, literature, stuff like that. But we have a program here at ISU called Creative Technologies. And the easiest way to think about it is that we have a School of Music, a School of Theatre and Dance, and a School of Art. And there's this program in the middle that pulls faculty from each one into this other collective. I'm what's called an affiliate faculty. I teach Virtual Reality designed for Creative Technologies. That said, Illinois State University's Creative Technologies Program (CTK) is experiencing exponential growth right now. It's grown really fast in the last few years. So, it's becoming a school that will break off; it will be our fourth school in the College of Fine Arts. We have what's called an interdisciplinary program in there, and that houses audio music production, game design, and interdisciplinary technologies. So, you can learn the "Sir Jack of all trades" about tech, art, coding, and more. We have plans for a VR [virtual reality] XR [extended reality] development program there. So yeah, it's exciting.

MR: I assume this is popular with the students.

RM: It's very popular. We get a lot of people who are excited about those programs. I mean, just generally in society, but then we get a lot of kids that come in, they go into computer programming, School of IT students, and then they realize that I don't know if I want to do backend HTML coding for a banking website or something. But they really like games, and they end up being the hardcore programmers for game design.

MR: I understand that you're the creator of a couple of software programs, but I'll start with your virtual reality composition programs, *solsticeVR*. Why did you create it? How is it used? You're a composer. (see Figure 2)

RM: My whole background is acoustic music, you know, paper. I use an iPad now, but I write by hand and compose. I started teaching at ISU in 2016, 2017, 2018 and I got some internal funding to support research. I decided virtual reality (VR) looks really cool; I'll buy a VIVE for the school, and I'll see what I can do with it. And that's the first time that I'd used VR outside of when I was little, like at a mall, or, like Google Cardboard. I got into an environment and

thought, wow, this is crazy. I mean, this was way more along at that point than I thought was really possible. And my first thought was, I want to write music for VR experiences. I want to write spatial audio stuff for VR. That quickly turned into I want to create environments with music and VR. And it became this rabbit hole of, okay, well, if you want to do these things, like go all the way to make VR, how do you do that? You have to learn an engine, you have to learn to code, you have to know all that stuff. That was 2017 or so. I started taking online classes. We had little, little kids then, so it was kind of fortunate in the sense that they would go to bed at 8:00 p.m. or so. And I would wake up with one of them at 1:00 a.m. and give them a bottle and then we're getting back to bed, and then I would just stay awake honestly, just stay up. So, I got like five hours sleep but then we'd have four or five hours in the middle the night where I was taking these classes online to learn VR and over time that led me to, okay, well what can you do with the tech? What can hand tracking do? What can you do with your hands in VR? What can you do with a virtual environment, you can't do in a digital audio workstation? And what it came to is not replacing anything in reality; you don't want to try to do what you could do with Pro Tools in VR, because it's going be worse at that. But you can do what the inverse of Pro Tools is. So, stochastic, random spatialized audio, really intuitive interfaces, where you don't have to know what all of the sliders and knobs and everything are doing, you can react and sort of perform with the music that you're creating in the virtual space. And then the interesting things that came out of that were that one, I didn't really think about how it's totally spatialized. So, it's like you're moving your head, and you're moving around your room, and your audio is placed in 3D space. So, you're creating this piece that's in your environment. But as you move and walk around, you're mixing, so you're recording what is happening, and it's getting the recording from your perspective. So, as you're turning your head, you're panning, and it's creating top-down effects. And it becomes very performance oriented; it's very intuitive, almost like dance that you do in a space to perform. And then take that audio and bring it into an audio workstation. And you can use it in a traditional piece. You can do this live; you can do whatever you want to do with it. And the cool things that have come from that are that it's super intuitive, and it's a way for anyone to make music. It is little kids doing it, lay people, composers, people writing acoustic music for electronics. But there have been these forks that have gone off. And I've worked with physicians who have used a version of it to recreate audio hallucinations from pediatric patients with psychosis because it's very intuitive. You can bring in sounds and manipulate them and move them around and create the stereo and mix the effects that the child is seeing or hearing. A physician can do it without having to know a complex audio workstation. That's kind of what that software is, or was, because I haven't been working on it in a while. But it was my entryway into the technology.

MR: Has it been used in teaching composition?

RM: I have used it. I had a semester where, as part of the testing, honestly, I had half a dozen students or so that all wrote music. They were finding bugs for me and pushing the software and trying to break it. There were two students that wrote pieces for graduate school with one that used it substantially in his piece. He was creating these textures and things and then wrote his thesis piece, which is a 25-minute electroacoustic piece. So that was a big tool for him. I have a colleague at Lewis University, Michael McFerron, who wrote several pieces that are live, so it's acoustic performer and him in VR, sort of playing with them and recording them, and then taking that recorded audio into VR and doing something with it, and throwing it around the room, you

know, all kinds of stuff. But honestly, it's at the point where now, the tech has changed so much in five years, so that I would love to revisit it with current generation technology and see what we can do. The tech is getting so much more portable and accessible, you could transfer it to people very quickly. So that's where it's at. It's a concept that's floating around, but it's currently in incubation.

MR: This brings me to your second creation, your conducting software *RibbonsVR*. How did you create that? How is it used?

RM: So, *Ribbons* I started working on later in the *solsticeVR* development cycle, like 18 months into it. I was doing hand tracking with a Leap Motion controller for the *solstice* app, using my hands in VR, moving my hands around. And eventually I thought, I wonder if you can conduct in VR? I went into a version of the app and put some effects in to see sort of a trail of where you're at and thought, oh, cool, you can see your pattern. I brought it to one of my colleagues from conducting and he kind of lost his mind. He was like, this is what we've always wanted in conducting pedagogy. That was 2019. We spent eight months or so iterating on that. And then we were about to start clinical trials on it the first week of March in 2020. And then we didn't do the trials because everything shut down. But honestly, in hindsight, that allowed the tech to advance a little bit. And by the fall of 2020, the portable Quest Tools had come out and they had hand tracking built into them. So, we sort of remade the app from less of a clinical thing where we would have people come in and test whether or not the software works to, oh, we could get five people in simultaneously for the same price. So, what we ended up doing was we had four or five Quest headsets and students in little pods in classes. And one student would be using a headset and conducting and doing these virtual exercises and getting immediate visual feedback. Other students would be watching them, in reality, they could just see their hands, but also, they could see a feed into VR and see what they see. And then in a large group setting, the students would be sitting, and someone could be wearing a headset and using what's called passthrough to mixed reality. So, they could see a video recording projected onto their screen of the students in front of them. It's kind of like augmented reality. They can conduct music, watch their students, and be conducting a rehearsal, while wearing a VR headset. And what was really cool is that we found the proficiency of basic conducting, the techniques, students got to this plateau more quickly than normally. So, they got to a certain level, and then you can push to advancement, more application kind of synthesis of knowledge. That's not possible if they're struggling to get their patterns straight; you can't actually be musical if they're not always hitting their three patterns, sometimes the two patterns. And it's still ongoing. They're planning on using it in the fall, the new headsets are coming out in the fall from Meta, so we're going to adapt and change it to that platform. Apple is releasing a VR headset in the spring, which is in its own classification of God-tier technology. We will definitely implement that when we can get one. It's been sort of floating out into the world, we have the trade shows or other universities who have been using it in their classrooms, and just getting feedback, honestly, to see what's helpful, what's not. As the tech advances, where should we push it and create a useful tool that supplements the in-person experience, but doesn't try to replace the pedagogical need of a master teacher? How can you force multiply the time that you're having face-to-face with students?

MR: Maybe I should backtrack here slightly. In principle, this issue of *MRSQ* is focused on artificial intelligence (AI). How would you define AI?

RM: It's such a broad thing. It takes in a lot of different technologies that I think that people misunderstand or lump together. The main thing to realize is that it's really old, right? This is not a new technology; AI is from the 1950s. Like people have been working on these concepts for a long time. There was a big bump in the early 1990s with compute power and then we saw this kind of moment, right last summer with generative AI where you start seeing image generation things are coming online like DALL·E and Midjourney and people were like, wait a minute, what this is what's going on? And then ChatGPT just ran through the door, and everyone was like deer in the headlights, like oh my God, what happens? But it's not a surprise, it's been coming for a while. I think the vast majority of people just weren't ready for it because they're not aware, don't think about it. I use the word force multiplier; it's a tool that can be used to assist a human being in some capacity. And I think it's best understood as that, a tool. It can be used and misused, and it probably shouldn't be ignored. It should be embraced and understood as best as possible. But I'm a composer who's coming to this as a lay person and have found myself in roles where I'm synthesizing this for pedagogy and talking to people about technology and how it can be used.

MR: It isn't the rise of the machines.

RM: That's the thing, though. Ilya Sutskever, Co-Founder and Chief Scientist at OpenAI, said they're going to essentially focus 20% of their resources on super intelligence and alignment. So, if a super intelligent AI does happen, we need to understand it, and it needs to align with us. It needs to be our friend. It needs to not be our enemy because that would be really bad. The thing that's interesting, and kind of scary, but also encouraging is that they gave themselves four years; it's a four-year window to do this. So, their belief is we have four years to figure this out. Right? Some people have come out and said point blank, we're going to know in 18 months, two years, really, honestly, we'll know if super intelligence will be a part of our lives in the next five or six years. We'll know in 2025. But anyway, you mentioned the Rise of the Machines, so I went on this tangent, but I think people see these things and think, "oh, super intelligent, that could melt our faces." But it's not science fiction, it just sounds like science fiction. It sounds like the *Terminator* or *Blade Runner* or *Snowpiercer* or any of these classic cyberpunk dystopian stories. Because it is. But the inverse is also really important to understand. Anything is on the table, right? If we get to that point, it's aligned, and we are able to control it. Christopher Pissarides—a professor at the London School of Economics who specializes in the impact of automation on work— he said the 2030s version of GPT, if we're on the scale that we're looking at, should be able to do 1.3 million years of human work in two months. So, if we're on that trajectory, we're going to look back on the pre-AI time, pre-2030, as just completely barbaric. Like the way that we lived. Why were you getting sick? Why was there no food? Why do people die of cancer? Why? Global warming, what was that like? This should solve everything. Right? We need an enzyme that will eat plastic. Okay, we need to release a specific type of compound into the atmosphere to reduce CO2. Humans won't see the patterns because it's just way too complicated. But this thing, this super intelligence, will crack it. And tell us how to do it and tell us how to manufacture, tell us how to build the plants. But it is like having a god almost. So yeah, it's being taken very seriously. I think it's very important in the macro, but also the micro, what do we do at a university? How does it impact music history, music, composition, and more?

MR: I have several questions all at once. For the person working in music education, teaching, working at a university, working in a music library, working in a music archive, I think maybe some basic definitions would help, even something as basic as the difference between augmented reality (AR) and virtual reality (VR).

RM: You can think of AR and VR as a continuum. So, on one end you have VR. And this is a completely digital environment. Everything is synthetic, everything you see is synthetic. It's like Ready Player One, you're in a complete simulation, the matrix. The other end of the spectrum is AR, and AR is digital content overlaid on your reality. So, holograms, Pokémon Go, Snapchat-like filters, those are all AR. The reality of the situation is neither of them are the future, the future is the middle, which is what most people call mixed reality. Apple is in this space. This is where they're heading, and they call it spatial computing. Apple doesn't ever use the terminology anyone else does because then they can always be the best at it, so they will say they're the best spatial computing company. Well, yeah, you're the only one who's using that term. But their tech is great. The $3 trillion company has decided this is their future, which means it's our future.

So, in the middle is the ability to move between your complete reality where you see everything around you and it's totally normal, to a virtual space where everything is replaced, or you can stop. And in the middle, in this mixed reality, this is where the tech is going to be. And I think we'll eventually stop using our MR, it's just going to be the kind of thing where you can have opaque physical objects in your room that you don't know if they're real unless you touch them, because they're reacting to the light in your room. Like if you have a television, virtual TV put on your wall that's 600 inches or something, it's getting reflective data from the lights, it just looks like there's a TV there, honestly, and you wouldn't know there's no TV unless you went out and tried to touch it and it's just your wall. Or you have plants and things that are growing on your couch that are changing colors. And you can have them react to different times of day or change what flowers are on them in fall, in the winter or whatever. It's going to be badass. And it seems kind of obtuse that you would live your life like that until you think, well, you're not going to have a phone, you're not going to have a computer. You'll have a very lightweight edge computing device. Something that's 100 grams that you can wear on your head, put on your glasses, you can be stylish. There's no compute power on it, it's all coming through the cloud. And then when people come to your house, they can see specifically what you want them to see. They can see you as you want to be seen, like your clothes can change based on who you are, who is looking at you. That's the tech where we're heading. It's that middle ground. There are a lot of problems we need to solve to get there. But I think the tech that's coming out this year from Meta, Apple, and a couple of other companies are really the first glimpse of that, that it really does work and it's really there. It's a question of user experience software and then all the physical problems that we have to solve; it's still heavy, it's still expensive.

MR: The first thing that popped into my mind, quite honestly, is the so-called information poor. This utopian future that we seem to be looking at costs money. Is this going to be reserved for the Jeff Bezos of the world?

RM: Yeah, I think it very well could. There are a couple of different paths that this could take. It could be very similar to the way we look at life today, where there are "haves" and "have nots," and this comes from socioeconomic status. But I think there's a very real possibility that these

things are going to be free. And they will come from Amazon, they will come from Google, they'll come from Meta, and you will be served the content that you want. They want you to see it's free. If you go and get an Alexa, you will put it in our kitchen, because you're using it for reminders and stuff. It's basically free. I mean, they're like $60, but it should be $400 or $500. It's so inexpensive, but they push ads, and they get your data, right? So, there will be a very real possible future where you have these dystopic scenarios where, yeah, I have got a headset, it is government issued. Or maybe it's Meta issued, or it's an Amazon one, but we got them all for our classes for free from Jeff Bezos. And we're all able to do that. But there's other things, like access to high-speed Wi Fif. So, I think that's one possibility. But I think it's also a real opportunity. This is a conversation I've had with ISU recently about AI, that the universities are beholden to provide access to these sorts of things, specifically, locally to our students. What value added do we offer to a student coming to university to get access to equipment, get access to the newest models of AI assistants, local ones that are safe for you to use for class that you would otherwise not have access to? Right? Or you could have access to with the cost a lot of money. So, you come here, part of your tuition is that, but it's also healthcare, childcare, whatever stuff that we can add to the value to the experience. But yeah, there's definitely that possibility that it's going to be the "haves" and "have nots." To be completely honest, I'm not totally worried about that. It could be a problem because, obviously, you create these sorts of rifts in society. But I'm way more worried about brain-computer interfaces, and what that will do. That tech actually matures. Then it's going to be very expensive. And if you are able to essentially create a link to GPT-7 in your mind, you're a god, right? You are a superhuman. That will be very expensive. And that's going to be extremely prohibitive. There will be no way to compete with people intellectually, physically, like in debate as politicians or as actors, no, you're not even possible. And if that happens, then that's the real God-like. Now we've created this complete stratification of society. It's probably going to happen, honestly, the tech seems like it's going to work.

MR: What are the ethics of this, the moral imperatives, especially if it's all primarily driven by private companies? Do universities need to step up? Would universities do any better?

RM: We need to provide access and understanding in education for students, and then obviously talk about the ethical implications of it. We also have to be aware of what society is doing. We have to know and train our students for their experience in the world. So, it does us no good if 70% of our students are expected to be able to leave ISU in three years and be expert prompt engineers with any number of AIs, because that's literally what their job is going to be. We want to transfer knowledge, but we really need to learn how to do that. We also need to teach them how to ethically do that, and how to apply the knowledge, synthesize it, how to do things that you wouldn't have been able to do otherwise. It's a huge issue. There's so much possibility for bad actors to do frightening things with AI technology. I've read several articles, when I'm explaining them to my wife, it sounds like I'm talking about a Joe Rogan podcast, but it's written by an Oxford professor. These are research scientists who are writing these things. That sounds so crazy, like they hear about all the different cults or rogue governments of the past, and how they failed, at, say, synthesizing this chemical and launching it. And here is the BDT, that biological design tool, that they have access to now and with ChatGPT, how they can do it. And they're not going to fail, they're just going to do it, you can do it if you want to. And there have been a couple of studies that showed this. If you want to create a chemical weapon, you can get the chemicals, and you can learn how to do it. Period. There are companies and institutions that

will sell these things without checking and then use the knowledge of open-source design tools and an LLM [Large Language Models] that'll teach you enough chemistry to get it done. You got it. So rogue nations, cults, fringe groups want to do these things. To say nothing of what are the nation states doing. It's probably absolutely terrifying what they have access to and what they're doing. There's the western government, the US and EU, but then what is China doing? What is North Korea? We need to stop and figure it out because, frankly, no one knows how the LLMs actually are working. There's a lot of writing by the people who are making them where they just footnote in these articles, "we're actually not sure why this happened, we don't know why it's able to do this, we don't know how it learned how to do this." Well, okay, maybe we should slow down and try and figure it out. But China's not going to slow down; they're just not. And you can't lose when we're talking about creating the most disruptive thing since fire. We can't stop now because everyone's running in one direction. We have to make sure we get to the end and try to throw up guardrails as we're going along. And that is what people are doing. The models are actually getting dumber, if you see stuff about ChatGPT, it was able to do X six months ago, and now it does it much more poorly because they're trying to make it safer. They're trying to eliminate possibilities, to make it stupider because it's not going to have all the interconnectivity to try to do something, "what was the workaround so that you were able to figure out to make anthrax or something like that?" We don't want that. So, ethically, it's a supercomputer, a super intelligent thing that we're trying to figure out policy for, while we're trying to encourage development, but we don't really understand how it works. We don't know what it's going to be used for. But we can't stop. It's an existential problem. It's something universities are traditionally not particularly good at, because we like to be very thoughtful and deliberative and use the power of everyone's experiences and have great debates. And by the time we're finished debating what the policy could be, we're going to be three generations behind, and it won't matter.

MR: I'll try to be more positive. What kind of uses can you see for AI very broadly, or more specifically for music pedagogy?

RM: One thing that I think we should focus on as teachers is whatever the opposite of AI is. So, the better that tech gets, the less value whatever it can generate is going to have. Any kind of thing that an AI could do, we need to be transitioning away from, and then transitioning to whatever our transfers of knowledge or pedagogical structure should be. There's the AI, you're going to use it, and you fine tune that with things like institutional versions, but then you're focused as a teacher on all the other stuff. For the most part, that's human stuff. It's the one-on-one experience, mentorship, community things, research, whatever you want to do as an institution. Art is, I think, well positioned. You're not going to get a music experience, you're not going to get an orchestra, or a band, or a drum circle, or a play theater performance with AI, you're just not. Yes, AI can generate art. But what people are going to want to pay for is the individual, the opportunity to know the individual, that you are the person. It's not about the art, and this is weird, the art is not going to have value, it's going to be the experience of knowing and working with the human. And that's cool. Honestly, there's something really beautiful about it, and very ancient about it, it's going back to this kind of connected, human experience. I think music is well positioned, honestly, to weather it just because it's going to be difficult for AI to find its way in. Our conducting app is a good example. It can be incorporated in teaching to take it to the next level, to get more accurate tracking, and things like that. We need to do some

machine learning work. We've got to create an algorithm that can anticipate motion and changes in direction. So that's a use of AI that finds its way into something that is about training someone to do something that's human. There are tons of applications. I've worked in the medical field and it's massive. For example, creating systems to encourage people to get mammograms. There's one that we looked at, it's a web of AI interaction with people that's able to send them seemingly human personalized messages on a regular basis. They're reminders. It's not like you get a ping and a text, it's this person talking to you and encouraging you, and just talking you through any issues. I tried an app the other day where I took a picture of a birthmark on my arm. It's a cancer detector, you just take a picture and send it off. And then 45 seconds later, it says 87% benign, here's our recommendation, and talk to your doctor. It's cool. That's AI. Image recognition tech. Huge. It's going to be lifesaving. There are so many incomprehensibly powerful things it's going to be used for, for access, and healthcare and just greater quality of life things. You'll be able to see immediate benefit in the next three or four years. Those are the things we need to focus on, otherwise I think the existential dread will set in and it's, like, we're all going to die.

MR: If I'm understanding you correctly, it's not about the music, it's about making music. That's what's going to separate the humans from the AI, so to speak.

RM: Anyone that's been in a music group will understand. The performances are fine, but it's the process. It's the rehearsals and the community and the relationships you build, the learning, the moments with your stand partner, that's what you remember. It's not about listening to the recording or hearing the concert. That's great, obviously, and that's not going to go away because physical experience is so important. We can just augment that in some way. So, you can get more people in the concert hall through virtual listening, instead of 200 people, you could have 5000 people because you can get the whole world. When you're sitting physically in the space, tap the glasses you're wearing on your head and move virtually around the hall to hear it from a different perspective. Go stand next to the piano and watch the pianist's hands. Be able to teleport around the venue and have different views, but it's still about the human element. You're not going to be able to replace that. You're going to have an AI friend that is indistinguishable from a human, that's already happening. The fact that it could be this physical, like augmented reality, or mixed reality human in front of you, is just fine. You're still not going to get that experience where you're going to go and sing in a choir with people. Maybe we get to the point where you can create your own synthetic AI choir with 75, discrete, different personalities, and voice ranges. I guess that's possible. But it's unlikely, it's not close. I still think there's the appeal of human interaction and I think people will see that more and more.

MR: Hopefully, we'll all get out of our basements. How would you anticipate using AI in music or musicological research?

RM: There's not a lot yet for music composition. I'm really excited about the ability to feed my music into AI, and to have it help me generate ideas. If I could say, I want to hear all my motives, create these motive trees for a piece. Can you give me 500 permutations? Because it's just faster. It's what I would have done naturally, but you get this responsive, kind of playful, sandbox-like experience quickly. Yes, there's going to be generative AI music. It already exists. I want to have a piece that sounds like it's classical, blah, blah, blah. And they're pretty good. Honestly, I mean, they nail the fives of the cadence, it sounds like Mozart. But again, that won't be worth anything.

It is worthless because it has no value. It can be used to fill a hole where we find a void of music. But the actual artistry, people will want to pay and want to work with someone who can do what AI cannot. In musicology, in anything that has writing, I think you want to seriously look at what it means to write prose. What is the outcome of that? Why did we write this paper for this class? What was the purpose? Is it to demonstrate knowledge? Well, you're going to have students that generate it. It's just not, not going to happen. And maybe you embrace that. Maybe you say, instead of having a 10-page term paper on X composer from the classical era, I want you to write and annotate a 300-page book on that composer. Okay, we have got to figure out how many chapters there would be, what would they be on? How can you go and generate an annotation? How do you source this? Then you create these long writings, and you have to work through all these different narrative threads, stuff that the AI is not going to do, but the human can sculpt. Work with examples that can be incorporated into the text. Stuff that's completely out of the realm of an undergraduate research student, right now. Or you go another route, you just don't do prose, period. You can even generate all the stuff you want on an AI, but you need to be able to do a 20-minute oral exam on this. I'm going to ask you questions, you need to be able to respond, if you can't, you will fail. Or you have to create other ways of demonstrating knowledge. It could be videos, like a teaching series, where you go and teach in class and you record yourself teaching with your friends, even if all the stuff you're saying is AI-generated. There's a lot of research that shows that just by going through and taking the time and synthesizing information, doing it, you're learning it. That's the point, right? I think on a larger scale, like on the active high academic researchers' scale, it's great. I use it all the time for editing. Say you have a submission and it's 1000 words, and then you have to submit a 300-word abstract. You just paste it in, and say, give me 300 words. What would that take? Like five seconds? You edit it, if you don't like it, I don't like that word, I want to include this. I do it, you can go back and forth and say, "I don't like this wording, take out all of these pronouns." It'll do it for you. But it's such a tool to do stuff like that. What researchers have said time and again is that it should eliminate the mundane, the boring, the time consuming, that you don't want to spend your time on. That is what it should be eliminating from our lives. So, whatever, you wish you weren't doing because you want to get to this level of creativity or synthesis application, get there faster, because you can just bag all the garbage. My wife is an English teacher and is getting her Master's and is writing her thesis. She's such a wordsmith. That's great because it's going to be better. AI is not better at writing than a human. But you can get to big chunks of prose really fast and then just rip it apart. I think so much more clearly. I would rather see 1000 words that start at zero and go left to right. This is what I want kind of the idea. No, I don't want that whole section. I want this here and then just start assembling it.

MR: I'm in the Department of Ethnomusicology and I feel these days that theory is everything. You want a new theory of knowledge? What is AI going to do with that?

RM: I don't really know what the current trends and theories are in ethnomusicology, but I would be inclined to say, okay, here are all the abstracts from the last two years on this topic. Here are the things that I like, give me 10 ideas. And it will do it. And they may be bad. I mean, I don't know. It's not going to do your homework for you. But it's going to make you think of stuff. It's a helpful tool to think, oh, yeah, I didn't see that connection. I didn't think of combining those concepts. It's an interesting way of approaching acts because it's a tool. That's what I want to teach. What people need to know about the tool is that it's so powerful. You feed it things and it

will help synthesize, even across languages. ChatGPT, I think, can perform extremely well in like 40 languages. So, you can feed it things in languages you can speak, but also languages that you can't. Help me understand this thing in Hungarian. So that's where I would start honestly. It wouldn't abstractly come up with new theories, but it can tell you what's happening. Can you tell me about this? Here's an article I read. Can you give me bullet points on that? I really like this point that you've highlighted there, can you give me 10 more ways you think that could relate to this article? And again, some of it is going to be bad, but some of it's like, wow, I didn't think of that and then that's where you start going.

MR: What do you think would be the implications or uses for AI in fieldwork?

RM: Image capture and capturing space in ways that are not now possible. I've talked a lot with one of my colleagues in art, Lea Cline, she's an art historian. She goes to Italy and studies Rome. They're digging up pottery and finding things, but it's always destructive. As soon as you start taking things out of the ground, you change the scene. So, they use photogrammetry, taking pictures and trying to recreate these 3D models. That technology is getting better and better. But you can use AI in creating Neural Radiance Fields or NeRFs. They're essentially 3D scans of an environment, but they are much faster than photogrammetry. They also collect and accurately capture, lighting, reflective data, and topography. Say you're taking 100 pictures, basically scanning around, then an AI looks at the 2D images and sort of blends them together and says this is what you saw, this is the 3D space. Then you have a 3D scan. You can take that and view it. Again, this is where it interfaces with AR or VR. You can send it home to people and they can be standing in that space and look at it. You have the capture of that moment.

MR: Okay, I'm in the middle of the Amazonian Rainforest and I'm trying to record the Mouse Ceremony of the Kĩsêdjê. How much equipment am I hauling into the rainforest?

RM: An iPhone. That would be predicated on some sort of Internet connection. You could bring sat [satellite] internet with you, then you would be fine. But you could do it offline, too, and just capture, like, a billion pictures and feed it through an AI, afterwords. And if you want to get audio, you bring a Zoom Ambisonic mic, they are like $300-400, battery-powered, then you drop it somewhere and you get four degrees. Ambisonics is 4-dimensional audio. [Ambisonics is a method for recording, mixing, and playing back three-dimensional 360-degree audio.] Then you can have the 3D scan of the environment and you place the audio at the placement of the microphone, your audio source is there, and then as the person moves about the 3D scan, they hear the audio accurately, it's positionally correct. It's not just a stereo field or even a 3D field, it's accurately captured.

MR: What do you see as the future of AI in music, music education, music composition, and music research?

RM: Hopefully for any aspect of those things that you find mundane, you can find an application to remove the things you don't want to do, to then free your time to do the things you want to do. So, in music education, I shouldn't be grading their homework, because I'm it. If the homework can be graded by an AI, it probably shouldn't be assigned. Honestly, because then the AI could generate the homework. So, you should be able to get a removal mark. That whole loop

is happening constantly with this side chat, basically, have an AI sanctioned by you or it's fed your information, and it can talk to students 24 hours a day, just like you. And then maybe you're given records of all the conversations they've had, so you can then peruse them or reference them to a student, just like an interaction of students. I think they're super powerful, because then your time is spent doing things which are completely inconceivable at this point, timewise. Meeting with students and being a champion for them. All the one-on-one stuff. Or doing synthesis level research with undergraduate students that we can't get to, because, this is absolutely true theory, they never get to the point that they can actually apply theory in undergrad. They just think it was this big Sudoku puzzle that they did in school. Can they say anything about music? If we can accelerate that and tell me why you hear the music this way, and what that's going to do, then that's awesome. In composition, any of the parts of the process that you feel you are not good at, or you want to rush through because they're either stressful or you're stuck or something. It should be, guide me. For any part of the process where you don't want to use AI, don't use it. For me, personally, the very beginning of the process is the absolute most difficult, I suppose. And then if I can, just act reflexively, almost like I'm looking at my students' work, oh, this is cool, this is bad, this is good, it's good to have this over here. Just do that as the beginning of composing, where I know all the things are based on whatever parameters I've set for my music. From my influences, from what I want this piece to do, and you sort of fine tune it. And you're getting fed textures and harmonic devices and things that you like, that's awesome. I want that right now. Again, just predicated on the actual end goal that is creating music that is communicated with people and has value because that which is AI-generated music will be worthless. What we consider having value is going to be about you creating the music, then you going to the performance and working with the performers, teaching the people, and being human. I would be terrified if I were a recording artist. That's a mess. There's so much AI-generated Drake floating around already. And it's distinguishable from the real thing.

MR: As an example, a professor is teaching a GE class of 500 students, the Music of Bollywood, what does AI do for them?

RM: Is that class for the students? The 500-person class shouldn't exist. These are existential conversations that we're having with the upper administration right now. What does it mean? What are they getting from that, that they can't get elsewhere? I mean, they're getting transfers of knowledge and the experience, but shouldn't the things that you're able to tell them be possible in another avenue that they can do at any point. And that the value added for them by going to, say, UCLA, is the scaffolding that you've put in place. You're aggregating all this data, and you're giving it to them in this AI thing where they can talk with it and get all the information that they need. Then your experience with them is not the 500-person class, instead they come to class once a week in groups of 15 or 20. You're seeing them in different ways. You're going to performances; you're doing these telepresence events in India. You said, Bollywood, right? And they're always referencing the things that they're learning on the side from these curated transfers of knowledge, those things that you are then helping them synthesize. That's what it should be or could be. But the idea of standing in front of 500 people, lecturing, I am sincerely worried that they're not going to value that, that students are not going to want to do it. Using my own personal experience, I was on sabbatical in the spring. I was studying electronic music and DAWs [digital audio workstations]. I was trying to get better at using Ableton and stuff. So, I signed up for a bunch of these online classes, and I was working through them. And like a month

into it, I just stopped watching the videos and used ChatGPT because it was faster. The videos are nice, but they're so slow. You can see, I click on that thing, right? Okay, cool. But it's so slow. After the actual transfers of knowledge, when you know what questions that you need to ask, and you have a sincere question, you can't get that answer from a 500-person lecture. You can't get that answer from the video. You can get that answer from this AI thing, and you can get it anytime you want. The value to the students will be, what do we do with that? You're showing them what to do with that, right? We're taking them on these journeys of synthesis, we're giving them access to being in groups, right? Like bringing in live performers, going to the movies, all the things that we could never do because we didn't have the time? That's what the students get. And that, I think, is awesome. That's what we should be doing anyway. It's just not currently possible. That's the existential thing. What we are, absolutely can change and should change. We should have done this a while ago, we just couldn't, but we knew it was not great. Post baby boomers, post-World War Two we knew, pedagogically, that it's not good to do lectures, it's just not good to learn like that. That's not how it works. We should be doing more problem solving, synthesis-driven education, which was completely impossible, given the number of students that were going to college. We can do that now. We should do that now. But in talking to administration, they're afraid of it, it just completely rips apart things like, what do credit hours mean? The entire system breaks, and then they just look like they want to throw up. But, yeah, it's bad, guys. But I do think if we don't embrace the change, if we don't think about building curriculum based on these principles, we might as well be writing on stone tablets.

MR: It could be amazing.

RM: It could be awesome. It's the way in which you roll out this stuff. It's not alienating people. It's not completely reinventing everything. We've thought about education. We're going to model things. We're going to show students that they are coming to a campus where we know that this is happening. We know we should be embracing this technology. Here are the studies that we're doing. Here are the test environments; we're using our own little model AI thing that's for UCLA, or for ISU, or wherever. This is the future, come and study this. And as faculty are learning and it's getting adopted, and people are retiring who don't want to do it, then it rolls out. I think it's probably similar to the Internet. I was right at the end of that adoption in college in the late 1990s, 2000. But I'm sure in the early 1990s, there was a similar discussion of "what are we going to do?"

MR: Is there anything that I haven't asked you that you would want people to know about you or your creations or AI?

RM: I come off as a futurist, but I'm not. I grew up on a farm. I really do appreciate gardening and touching grass and those kinds of things. I just think that we really can't screw this up. It's important. Our future is a concept. Higher education is going to be tied to this. It's something we need to familiarize ourselves with, the tools are out there. Go to bard.google.com. Start talking to Bard and just mess around. The PaLM model [Pathways Language Model] is cool. Learn what it can do. ChatGPT 3.5 is free, chat.openai.com. Go play with it. Go play with Bing AI. Just experiment, watch some videos. Go to YouTube and watch the Google Bard tutorial. There'll be people explaining how to prompt engineer. Try to get familiar with it and look at it as a tool. It's not going away. This is not a head in the sand moment, where this whole thing's going to die

down. ChatGPT is in the search bar in Windows 11. Within the year, it's going to be in Office in Word. It will be a “how do you want to start” prompt and you can type in a sentence, and it'll give you 500 words. So, pretending that's not going to happen, it's not helpful for anyone. Go and try to learn about it and figure out how you can apply it. That's good. I don't think that's bad. It's painful, upsetting, and scary at times. But it's also profoundly exciting and powerful. The more you read, I think those extremes will become clearer. The more you learn, yeah, we are edging closer to doomsday for sure. But at the same time, we're creating a tool that could cure cancer in five years. If it's a thing that can synthesize anthrax, it can also synthesize a drug that cures Alzheimer's. That is just amazing. And you can figure out how to 3D print food at zero cost and eliminate plastic in the ocean. It's all there and it's super cool. I get why people are nervous. I also get when folks from these companies who, yes, are sitting on a quadrillion dollar goldmine, are saying we can't not do this. I tend to agree. I think we're on track to do some incredible things in the next 5, 6, 7 years. And the best thing we can do is understand and adapt and be creative and human with it and help with the ethics and synthesizing for students and helping people learn.

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