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Education

M.S. Recording Arts – University of Colorado Denver 2007

B.A. Biochemistry, Chemistry minor – University of Colorado Boulder 1997

Employment

University of Colorado Denver – Recording Arts Instructor, Area Head, MSRA Program Director 2007 – Current

- Taught in multiple departments: Physics, Recording Arts, inWorks Interdisciplinary Studies
- Developed graduate and undergraduate courses and programs from the ground up
- Graduate thesis/portfolio advisor
- Currently managing new curriculum development for graduate and undergraduate programs
- Foster internship and industry relationships

Signal-to-Noise Media Labs Artist Collective – Director 2010 – Current

- Run an interdisciplinary research collective comprised of artists, scientists, and engineers that educate and express art through technology
- Actively study, develop, and fabricate high and low-tech art installations and programs with accessible and open-source hardware and software
- Host weekly meetings in our own hacker/maker space

Merkel Acoustic Research & Design – Chief R&D Officer/Owner 2008 – Current

- Conduct research and design in loudspeakers, acoustic treatment, and room acoustics
- Design, fabricate, and test high-end DSP-controlled loudspeakers from conception to finishing
- Develop tools and methodology for electrical and acoustic measurement and testing
- Acoustic consulting and material fabrication for private and public spaces

University of Denver – Lecturer in Emergent Digital Practices Winter 2017

- Taught data-driven synthesis of visuals, data, and audio using Max/MSP
- Used visual and data flow programming to develop generative and interactive art installations

8 Houses Down Studios LLC – Owner/Mastering Engineer 1999 – 2014

- Started and ran award winning music, audio post-production, and mastering studio
- Developed the business and built multiple studios from the ground up
- Employed numerous engineers and managed internships

University of Colorado Boulder – Lecturer 2000 – 2006

- Taught and co-taught the Physics of Music and Sound lectures and recitations to 100+ class sizes
- Oversaw study groups, grading, and demonstration development

Volunteer

Denver Museum of Nature and Science – Planetarium/Immersive Technologist 2012 – Current

- Developed audio and video technologies for realtime live performances in the dome
- Consult on acoustics and equipment installation and use
- Produced and engineered numerous live productions

Front Range Community College – Audio Production Advisory Board 2017 – Current

- Work with FRCC faculty and admin to build “feeder” paths to UCD Recording Arts
- Advise and build consensus on best practices

STEM Academy Advisory Committee 2016 – Current

- Work with STEM Academy in Highlands Ranch to advise on audio production at high school level
- Developing a recruiting paths to UCD for STEM students interested in technical audio careers

Girls Rock Denver 2017 – Current

- Volunteer with recoding and post production for promotional materials
- Building an audio engineering teaching component to the already amazing work being done

Current Research Projects

Immersive Sound for Live Performance 2016-Current

With out Outside In project we are investigating different ways of using immersive systems for live performance, including VR/AR, live dancers, augmented electroacoustic ensembles, integrated visuals. I have been building custom tools and software to make it easy for artists and musicians to integrate in the system.

Past Research

Localizing Sound Sources in 3D 2014-2016

Localizing speakers (and other sound sources) in three dimensions with extreme accuracy is critical when working, mixing, and performing in multi-source environments. While there are closed-source commercial products that perform this we are building an open source platform that can be easily utilized in many environments.

Mixing Audio in 3 Dimensions 2008-2014

Working in association with Gates Planetarium at the Denver Museum of Nature and Science, we were tasked with building realtime, approachable toolsets for spatializing, remapping, and mixing in a 15.1 hemispherical space using ambisonics. Our system performs loudspeaker and room acoustic correction.

Spatialization and remapping of audio in a 3-dimensional surround environment 2007 – 2009

Our team was brought on to assist Gates Planetarium at the Denver Museum of Nature and Science in two areas. The first was to optimize the unique and difficult dome 15.1 surround sound environment. The second objective was to develop methods for transferring audio productions between planetariums, which currently have no standard format.

Empirical Study of Transmission Line Loudspeakers 2006 – 2007

Transmission line loudspeakers are a unique type of loudspeaker that utilized a damped line for extended low-end frequency response and improved transient response. Because of the unique possible geometries relatively few crude models have been developed. This study was conducted to gain empirical insight into frequency and impedance changes as a function of damping placement.

Publications

Methods for Sharing Stereo and Multichannel Recording Among Planetariums
AES Convention Paper 7474, 2008

Speaking, Guest Lectures, Panel Appearances

Colorado AES Section – 2017

Hosting and presenting on tools and workflow for working with spatial audio for VR/AR. Demonstrating recording and processing techniques

Meow Wolf – 2017

Presented to the Meow Wolf Technical Crew on ambisonics and immersive audio techniques for live performance. Demonstrated practical calibration techniques and workflow using Ableton Live and custom Max/MSP programming.

Maker Faire Denver – 2017

Gave a presentation titled "How we hear in three dimensions with two ears." The talk was an introduction to the physics of binaural hearing and how we "hack" our physiology to recreate convincing 3D soundscapes with applications in VR/AR and 360 video.

Boulder Ableton Live User Group – 2017

Presented on Max for Live Basics. Demonstrated the fundamentals of signal flow and building a basic synthesizer inside Max for Live

Boulder Music Tech Hackers – 2017

Gave a presentation titled "Interactive and Immersive 3D Audio." Gave a basic theory of surround and ambisonics then demonstrated and performed on a small-scale version of our Outside In project.

Denver Creative Tech – 2016

Presented with Signal-to-Noise team on working with audio in full dome environments. Demonstrated the code, technology, and workflow for working in immersive environments.

Biennial of the Americas STEAM Panel – 2015

Sat on a panel and discussed the role of science, technology, engineering, arts, and math in education

Mini-Maker Faire Denver – 2015

Sat on a panel discussing changes in the creative landscape using technology.

Boulder Digital Works – 2014, 2015

Guest lectured and ran creative sprints with Max/MSP.

IMERSA Summit – 2012, 2013, 2014

Developed and demonstrated Max/MSP toolsets for working with spatial audio in a 3-dimensional audio environment. Also performed interactive music set with audience participation.

FullDome Festival – Jena, Germany 2013

Presented on audio workflow in immersive environments.

Rocky Mountain Audio Fest – 2009, 2010, 2011, 2012, 2013, 2014, 2017

Each year lectured, gave tutorial sessions, and hosted a demonstration room on the physics of sound and loudspeakers and general acoustics. Exhibited one of my optimized 5.2 sets with custom 7.1 bass management. In 2017 we showed a 10.1 ambisonic-based setup with interactive controls.

AXPONA – 2014, 2015

Gave lecture/tutorial sessions on the physics of sound and loudspeakers and general acoustics

Denver School for the Arts – 2012, 2013

Designed and gave a two week course on applied acoustics to a senior-level audio production class

Audio Engineering Society Career Panel 2009

Appeared numerous times on the AES Student Career Panel discussing my career path and offering career advice/guidance

MEIS Music Business Classes Guest Lecturer 2007

Spoke as a guest lecturer on the business of running a professional audio production studio. Discussed small business entities and accounting practices.

Masters in Recording Arts Research and Library Studies

Regularly guest lecture with the incoming graduate class about effective strategies for completing the program and answer questions about the graduate school process.

Societies and Associations

- Audio Engineering Society – Since 2003
- American Loudspeaker Manufacturers Association International – Since 2009
- Colorado Game Developers Association – Since 2005 (on and off)
- Colorado Independent Game Developers – Since 2012

Conferences, Conventions, Symposiums, & Expos

- Burning Man – 2014, 2015
- Biennial of the Americas – 2015
- Denver Music Hack Day – 2013
- Global Game Jam – 2013, 2015, 2016
- Audio Engineering Society Convention – 2006, 2007, 2008, 2009, 2010, 2011, 2013
- AXPONA – 2014, 2015
- ALMA International Symposium – 2010, 2012
- CEDIA – 2009, 2013
- Game Developers Conference – 2000, 2001, 2005
- E3 Expo – 2000, 2001, 2002
- Dolby Surround Conference – 1999

Art Installations, Festival Productions, and Performances

Monthly First Friday Show/Installations

Ongoing

We currently host traditional and experimental interactive art shows on a monthly basis in our space located in the RiNo Art District in Denver.

Outside In at Maker Faire Denver

October 2017

Set up a 50' ring of speakers with light, demonstrating immersive environments. Had interactive control sensors, analog synthesizers, and hosted guest musicians and performers in 16.1 ambisonics.

Outside In at Arise Music Festival

August 2017

Set up the full 16.1 ambisonic system with height. Performed for the entire festival and included interactive controllers and analog synthesizers.

Outside In at Apogaea

January 2017 – Current

Outside In is a large-scale immersive audio platform for indoor/outdoor live performance. It was a granted art project from Apogaea and was originally designed for festival use but has continued to evolve into a scaleable immersive system. For Apogaea we performed sound art and had numerous interactive components for visitors to engage with.

An Amalgamation of Art and Technology – Denver Startup Week

September 2016

Hosted over 10 interactive artists in our space for Denver Startup Week ranging from tactile digital performance screens and projection mapping of virtual reality music synthesis performances and massively high-count particle system demonstrations. I showed a piece called *Me, Myself, and I* that was a self-facing camera that played with visuals of the user with multiple non-linear delays.

The Playground – Denver Startup Week

September 2015

For Denver Startup Week we hosted an interactive party that included multiple projection mapping installations by international video artists, local musicians/DJs, and set up interactive installation stations that included Arduino-based drawing machines, virtual reality synthesizers, hand-tracking drum machines, and custom laser cutting/engraving.

Amalgamation – Biennial of the Americas Hackathon

July 2015

Hosted "Amalgamation," a hackathon was a casual 48 hour event open to all ages and abilities where participants use sensors, Arduino, and any software platform they want to create generative sound, music, and/or visuals.

Open Windows at Denver International Airport

December 2014

Open Windows is a large-scale, permanent, interactive LED-based installation located near gate B52. An 8x8 grid of 1 foot diameter discs with enclosed RGB LED create a generative, interactive customer experience from motion and skeletal tracking. The platform is open source and available for guest creative coders to showcase their work on it as well as a teaching tool for generative, interactive art.

Biennial of the Americas Theme Launch – Now!

September 2014

Created and interactive Unity-based projection mapped room with Signal-to-Noise where users explored spaces through hand gestures. Both Gov. Hickenlooper and Mayor Hancock attended and explored with us!

Diskopella – Burning Man Art Car

August 2014

Our camp built a giant roving space ship with a 20 foot mirrored disco ball that opened like a lotus flower and shot flames into the sky. The setup was complete with a DJ setup, dance floor, and massive sound system. My role was in fabrication, sound system design/maintenance, and some LED programming.

I've Got My Eyes on You

July 2013

20 projection-mapped eyeballs effectively "watched" users as they entered and walked around the install area. The Xbox Kinect, Max/MSP, Touch Designer, beach balls, and projectors were used.

Realm of Light Realtime Spatialization Tools – Gates Planetarium

June 2012

Using Max/MSP, Jack Audio, and Nuendo I developed a real-time tool set that allows users to input any audio source to spatialize and remap the audio to sound correct in the 15.1 surround environment in Gates Planetarium. Very expensive, outdated, and not-quite-right technologies were replaced with a simple to use real-time environment.

Passages – Create Denver 2012

May 2012

Partnering with Legwork Studio we created an interactive install for Create Denver week where users interacted with a projection to "move" between different virtual environments. I did all of the audio programming and sound design using Max/MSP

Artist Grant Awards

- Meow Wolf – 2017
- Arise Music Festival – 2017
- Apogaea – 2017
- Biennial of the Americas – 2015

Specific Skills, Software, and Hardware

- Game Engines – Unity 3D, Unreal
- Game Audio Engines – WWISE (certified), FMOD, Fabric, Unity and Unreal built-in
- CAD/CAM – Autodesk Inventor, Fusion 360, Solidworks
- Programming – Max/MSP, Pure Data, Touch Designer, Processing (Java), Unity 3D(JS and a little C#), general Javascript, C
- Schematic and PCB Design – EAGLE PCB
- Design – Adobe Creative Cloud
- Fabrication – Wood & metal CNC, 3D printing, welding, plasma cutting, laser cutting/engraving, powder coating wood finishing, metal finishing, injection molding
- Open Source Hardware – Arduino, Raspberry Pi, Beaglebone Black

Course Teaching History

University of Colorado Denver

Fall 2017 <ul style="list-style-type: none">Recording Arts Area HeadMUSC 3550 – Critical Listening (3 Sections)MUSC 4820/5820 – Digital Music Techniques	Spring 2018 <ul style="list-style-type: none">Recording Arts Area HeadMUSC 4581/5581 – Audio Production Seminar IIMUSC 4575/5575 – Surround SoundMUSC 4525/5525 – Multimodal Interaction for Music
Fall 2016 <ul style="list-style-type: none">Recording Arts Area HeadMUSC 3550 – Critical Listening (3 Sections)MUSC 4820/5820 – Digital Music Techniques	Spring 2017 <ul style="list-style-type: none">Recording Arts Area HeadMUSC 2550 – Audio Production IIMUSC 4560 – Mastering & Advanced Digital AudioMUSC 4575/5575 – Surround SoundMUSC 4525/5525 – Multimodal Interaction for Music
Fall 2015 <ul style="list-style-type: none">MUSC 3550 – Critical ListeningMUSC 4500/5500 – Max/MSP and Max for LivePHYS 3620 – Physics of Music & Sound	Spring 2016 <ul style="list-style-type: none">MUSC 4510/IWKS 4510 – Multimodal Interaction for MusicMUSC 2560 – Audio Production IIPHYS 3620 – Physics of Music & Sound (2 sections)
Fall 2014 <ul style="list-style-type: none">MUSC 2540 – Audio Production IPHYS 3620 – Physics of Music & Sound	Spring 2015 <ul style="list-style-type: none">MUSC 2560 – Audio Production IIPHYS 3620 – Physics of Music & Sound
Fall 2013 <ul style="list-style-type: none">MUSC 3550 – Critical Listening for Recording ArtsMUSC 4550/5550 – Audio Production IIIPHYS 3620 – Physics of Music & Sound (2 sections)	Spring 2014 <ul style="list-style-type: none">MUSC 4560 – Mastering & Advanced Digital AudioMUSC 4500/5500 – Max/MSP and Max for LivePHYS 3620 – Physics of Music & Sound (2 sections)
Fall 2012 <ul style="list-style-type: none">MUSC 4580/5580 – Audio Production Seminar IPHYS 3620 – Physics of Music & Sound	Spring 2013 <ul style="list-style-type: none">MUSC 2560 – Audio Production IIPHYS 3620 – Physics of Music & Sound (2 sections)
Fall 2011 <ul style="list-style-type: none">MUSC 2560 – Audio Production IIMUSC 4581/5581 – Audio Production Seminar IIPHYS 3620 – Physics of Music & Sound	Spring 2012 <ul style="list-style-type: none">MUSC 4560 – Mastering & Advanced Digital AudioPHYS 3620 – Physics of Music & Sound
Fall 2010 <ul style="list-style-type: none">MUSC 3540 – Studio Maintenance & CalibrationMUSC 2560 – Audio Production IIPHYS 3620 – Physics of Music & Sound (2 sections)	Spring 2011 <ul style="list-style-type: none">MUSC 3540 – Studio Maintenance & CalibrationMUSC 2470 – Music Applications on the PCPHYS 3620 – Physics of Music & Sound
Fall 2009 <ul style="list-style-type: none">MUSC 3540 – Studio Maintenance & CalibrationMUSC 2470 – Music Applications on the PCPHYS 3620 – Physics of Music & Sound (2 sections)	Spring 2010 <ul style="list-style-type: none">MUSC 4500/5500 – Loudspeaker Design & TestingMUSC 3540 – Studio Maintenance & CalibrationPHYS 3620 – Physics of Music & Sound (2 sections)
Fall 2008 <ul style="list-style-type: none">MUSC 4500/5500 – Loudspeaker Anatomy, Testing, & DesignMUSC 2470 – Music Applications on the PC	Spring 2009 <ul style="list-style-type: none">MUSC 3540 – Studio Maintenance & CalibrationMUSC 2540 – Audio Production I
Summer 2008 <ul style="list-style-type: none">MUSC 2560 – Audio Production II	
Fall 2007 <ul style="list-style-type: none">MUSC 2470 – Music Applications on the PC	Spring 2008 <ul style="list-style-type: none">MUSC 4500/5500 – Loudspeaker Anatomy, Testing, & DesignMUSC 2560 – Audio Production IIMUSC 2470 – Music Applications on the PC

University of Denver

Winter 2017 <ul style="list-style-type: none">Visual Programming with Max/MSP	
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