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Chad McKell

ABOUT

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Summary — I am a Ph.D. student at UC San Diego and a member of Reality Labs at Meta. In my research, I develop computational and mathematical tools for physical simulation and geometry processing. My research has applications in music, animation, virtual reality, and other fields.

EDUCATION

9/19–	**University of California San Diego**, Ph.D. in Computer Music GPA: 4.0. Coursework: acoustics, differential geometry, DSP, computer graphics. Dissertation: structure-preserving solvers for the open-boundary wave equation. Advisors: Albert Chern, Tamara Smyth, and Miller Puckette.
9/16–10/17	**University of Edinburgh**, M.S. in Acoustics and Music Technology
8/09–12/15	**Wake Forest University**, M.S. in Physics
6/02–8/09	**Brigham Young University**, B.S. in Biophysics

PROFESSIONAL EMPLOYMENT

8/21–	**Meta (Reality Labs)**, Research Intern/Student Researcher (Acoustics)
7/18–7/19	**Applied Research in Acoustics**, R&D Scientist (Acoustics)
9/12–12/12	**Bennett Aerospace**, Engineering Intern

ACADEMIC EMPLOYMENT

9/19–	**University of California San Diego**, Teaching Assistant/Researcher (Music)
9/12–12/12	**University of North Carolina School of the Arts**, Adjunct Instructor (Physics)
9/09–9/11	**Wake Forest University**, Teaching Assistant (Physics)
9/08–6/09	**Brigham Young University**, Tutorial Lab Assistant (Physics)
8/07–3/09	**Brigham Young University**, Research Assistant (Philosophy)

CONSULTING

5/18–5/18	**Moog Music**: Audio effects development in C++ for digital sound synthesizers.
4/17–9/17	**Lofelt**: DSP development and physics-based modeling for audio-haptic devices.
10/14–8/16	**J.P. Morgan/Neovest**: QA software development in Java for J.P. Morgan's investment trading platform, Neovest.

PROFESSIONAL RESEARCH ACTIVITIES

8/21– **Meta (Reality Labs)**, Research Intern/Student Researcher
La Jolla, California. Research areas: *acoustics, applied mathematics.* Conduct computational acoustics research for virtual and augmented reality devices. Research topics include spatial audio, numerical simulation, parallel programming, and discrete complex analysis. Supervisor: Sebastian Prepeliță. Team Lead: Ravish Mehra.

7/18–7/19 **Applied Research in Acoustics**, R&D Scientist
Culpeper, Virginia. Research areas: *acoustics, digital signal processing.* Developed physics-based signal processing algorithms for naval sonar systems. Research topics included underwater acoustics, matched filtering, sparse estimation, and beamforming. Team Lead: Jonathan Botts.

ACADEMIC RESEARCH ACTIVITIES

9/19– **University of California San Diego**, Ph.D. Student
La Jolla, California. Research areas: *acoustics, applied mathematics.* Develop structure-preserving solvers for the open-boundary wave equation. Research topics include spatial audio, numerical simulation, discrete differential geometry, and non-Euclidean geometry. Committee: Albert Chern, Tamara Smyth, Miller Puckette, and Sebastian Prepeliță.

1/17–8/17 **University of Edinburgh**, Master's Student
Edinburgh, Scotland. Research areas: *acoustics, digital signal processing.* Developed physics-based numerical simulations of speech sounds and structural vibrations. Research topics included speech acoustics, elastodynamics, modal synthesis, and finite-difference time-domain methods. Advisor: Stefan Bilbao.

1/10–9/13 **Wake Forest University**, Master's Student
Winston-Salem, North Carolina. Research areas: *optics, fluid dynamics.* Implemented transverse nanoparticle tracking in surface-isolated laser traps. Research topics included optical trapping, laser beam characterization, and fluid diffusion. Advisor: Keith Bonin.

8/07–8/09 **Brigham Young University**, Undergraduate Student
Provo, Utah. Research areas: *biophysics, structural biology.* Analyzed structural changes in lipid bilayers following exposure to a general anesthetic. Research topics included cellular membrane biology and atomic force microscopy. Advisor: David Busath.

TEACHING EXPERIENCE

UCSD

MUS 5	Sound in Time—*TA*. Spring 2020 (1 term).
MUS 6	Electronic Music—*TA*. Fall 2020 (1 term).
MUS 15	Popular Music: David Bowie—*TA*. Winter 2021 (1 term).
MUS 15	Popular Music: Video Game Music—*TA*. Winter 2020 (1 term).
MUS 171	Computer Music I—*TA*. Winter 2022 (1 term).
MUS 172	Computer Music II—*TA*. Spring 2021 (1 term).

UNCSA

SCI 1100	General Physics—*Instructor*. Fall 2012 (1 term).

TEACHING EXPERIENCE (CONT.)

WFU

PHY 113	General Physics I (Mechanics)—*TA*. 2009–2011 (4 terms).
PHY 114	General Physics II (E&M)—*Tutor*. Fall 2010 (1 term).

BYU

PHSCS 105	General Physics 1 (Mechanics)—*Tutor*. 2008–2009 (2 terms).
PHSCS 106	General Physics 2 (E&M)—*Tutor*. Winter 2009 (1 term).
PHSCS 121	Principles of Physics 1 (Mechanics)—*Tutor*. 2008–2009 (2 terms).
PHSCS 123	Principles of Physics 2 (Waves/Thermo)—*Tutor*. W/Sp 2009 (2 terms).
PHSCS 220	Principles of Physics 3 (E&M)—*Tutor*. W/Sp 2009 (2 terms)

PH.D. COURSEWORK

CSE 167	Computer Graphics I (Jürgen Schulze)
CSE 169	Computer Animation—*audit* (Steve Rotenberg)
CSE 274	Discrete Differential Geometry (Albert Chern)
CSE 291	Physical Simulation—*audit* (Steve Rotenberg)
CSE 299	Differential Geometry Research (Albert Chern)
MUS 206	Spatial Audio (Shahrokh Yadegari)
MUS 206	Deep Learning for Music Generation (Shlomo Dubnov)
MUS 206	Computational Acoustic Modeling (Tamara Smyth)
MUS 267	Advanced Computational Acoustic Modeling (Tamara Smyth)
MUS 270A	Digital Audio Processing (Tamara Smyth)
MUS 270B	Analysis of Musical Sound (Miller Puckette)
MUS 270C	Compositional Algorithms (Miller Puckette)
MUS 270D	Advanced Projects in Computer Music (Puckette/Smyth)
MUS 298	Spatial Audio Research (Puckette/Smyth/Dubnov)
MUS 298	Differential Geometry Research (Miller Puckette)

PUBLICATIONS

Journal Articles

(1) **C. McKell** and K. Bonin, "Optical corral using a standing-wave Bessel beam," *Journal of the Optical Society of America B*, Vol. 35, No. 8, 1910–1920, 2018.

Conference Proceedings

(2) **C. McKell**, "Sonification of Optically-Ordered Brownian Motion," In Proceedings of the International Computer Music Conference (ICMC), Utrecht, Netherlands, September 2016.

Master's Theses

(3) **C. McKell**, *Real-Time Physical Modeling for Haptic Feedback Rendering*, Final Project Dissertation, University of Edinburgh, Acoustics and Audio Group, 2017. (Advisor: Stefan Bilbao).

(4) **C. McKell**, *Finite-Difference Simulations of Speech with Wall Vibration Losses*, Special Project Dissertation, University of Edinburgh, Acoustics and Audio Group, 2017. (Advisor: Stefan Bilbao).

(5) **C. McKell**, *Confinement and Tracking of Brownian Particles in a Bessel Beam Standing Wave*, Master's Thesis, Wake Forest University, Department of Physics, 2015. (Advisor: Keith Bonin).

PUBLICATIONS (CONT.)

Technical Reports

(6) **C. McKell**, H. Conley, and D. Busath, "AFM Study of Structural Changes in Supported Planar DPPC Bilayers Containing General Anesthetic Isoflurane," Brigham Young University, Paper 827, 2010.

Conference Abstracts

(7) K. Bonin and **C. McKell**, "Tracking Brownian Particles in a Standing-Wave Bessel Beam 2D Optical Trap," SPIE: Optical Trapping and Optical Micromanipulation, XIV Meeting, 2017.