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Chad McKell

ABOUT

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Research — I am a Ph.D. candidate at UC San Diego based in the Center for Visual Computing and the Department of Music. I am primarily interested in geometry-based acoustic simulation and its applications in computer graphics, audio technology, and hearing science. Current research topics include variational methods for modeling fluid-structure interactions in musical instruments and human hearing; Kelvin transformations for handling obstacle and domain boundaries in acoustic wave simulations; and parallelization of numerical integration schemes.

EDUCATION

9/19–	**University of California San Diego**, Ph.D. in Computer Music GPA: 4.0. Dissertation: *Geometric Methods for Acoustic Simulation.* Advisors: Albert Chern (CSE) and Miller Puckette (Music).
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

EMPLOYMENT

9/19–	**University of California San Diego**, Teaching Assistant/Researcher (Music)
8/21–3/22	**Meta, Reality Labs Research**, Research Intern/Student Researcher (Acoustics)
7/18–7/19	**Applied Research in Acoustics**, R&D Scientist (Acoustics)
5/18–5/18	**Moog Music**, Freelance Audio Software Developer (Audio DSP)
4/17–9/17	**Lofelt**, Freelance Acoustic Simulation Researcher (Acoustics)
10/14–8/16	**J.P. Morgan/Neovest**, Consulting Software Development Engineer in Test (QA)
8/12–12/12	**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)

RESEARCH ACTIVITIES

9/19– **University of California San Diego**, Ph.D. Student/Candidate (Acoustics)
La Jolla, California. Research topics: *virtual acoustics, sound simulation, hearing science, differential geometry.* Dissertation summary: develop geometric methods for simulating the acoustics of 3D environments, musical instruments, and human hearing. Committee members: Albert Chern (co-chair, Computer Science), Miller Puckette (co-chair, Music), Melvin Leok (Mathematics), Shahrokh Yadegari (Music), Stefan Bilbao (Music, University of Edinburgh), and Sebastian Prepeliță (Audio, Reality Labs at Meta).

RESEARCH ACTIVITIES CONT.

8/21–3/22 **Meta, Reality Labs Research**, Research Intern/Student Researcher (Acoustics)
La Jolla, California. Research topics: *binaural audio, numerical simulation, parallel programming, discrete complex analysis.* Research summary: conducted computational acoustics research for virtual and augmented reality devices. Supervisor: Sebastian Prepeliță. Team Lead: Ravish Mehra.

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

1/17–8/17 **University of Edinburgh**, Master's Student (Acoustics)
Edinburgh, Scotland. Research topics: *speech acoustics, elastodynamics, numerical simulation.* Thesis summary: developed physics-based numerical simulations of structural vibrations for haptic feedback devices. My thesis was partially funded by Lofelt, a Berlin-based haptic feedback company acquired by Meta in 2022. Advisor: Stefan Bilbao.

1/10–9/13 **Wake Forest University**, Master's Student (Physics)
Winston-Salem, North Carolina. Research topics: *optical trapping, laser characterization, fluid diffusion.* Thesis summary: implemented transverse nanoparticle tracking in surface-isolated laser traps. Advisor: Keith Bonin.

8/07–8/09 **Brigham Young University**, Undergraduate Student (Biophysics)
Provo, Utah. Research topics: *structural biology, scanning probe microscopy.* Research summary: studied the effect of anesthetics on lipid bilayer structure using 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*. 2021–2022 (2 terms).

UNCSA

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

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* (Chern/Rotenberg)
CSE 299	Differential Geometry Research (Albert Chern)
MUS 206	Spatialization (Shahrokh Yadegari)
MUS 206	Deep Learning for Music Generation (Shlomo Dubnov)
MUS 206	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	Virtual Acoustics Research (Puckette/Smyth/Dubnov)
MUS 298	Differential Geometry Research (Miller Puckette)

PUBLICATIONS

Manuscripts in Progress

(1) **C. McKell**, M. Nabizadeh, S. Wang, and A. Chern, "Wave simulations in infinite spacetime". Submission planned for June 2023.

(2) **C. McKell** and S. Prepeliță. Topic: simulations of head-related transfer functions. Submission planned for 2023 or 2024.

Journal Articles

(3) **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

(4) **C. McKell**, "Sonification of optically-ordered Brownian motion," In Proceedings of the International Computer Music Conference (ICMC), Utrecht, Netherlands, September 2016.

Master's Theses

(5) **C. McKell**, *Real-time physical modeling for haptic feedback rendering*, Final Project Dissertation, University of Edinburgh, Acoustics and Audio Group, 2017. (Advisor: Stefan Bilbao).

(6) **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).

(7) **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).

Technical Reports

(8) **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.