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Chad McKell

ABOUT

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Summary — I am a Ph.D. student at UC San Diego. In my research, I develop computational techniques for simulating physical phenomena such as sound, light, fluid motion, and solid motion. For my Ph.D. thesis, I study computational geometric techniques for sound synthesis. My research has applications in computer music, computer graphics, augmented reality, and other fields.

EDUCATION

9/19– **University of California San Diego**, Ph.D. in Computer Music
GPA: 4.0. Coursework: acoustics, computer graphics, DSP, machine learning.
Thesis topic: computational geometric techniques for sound synthesis.
Mentors: 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

ACADEMIC APPOINTMENTS

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)

PROFESSIONAL EMPLOYMENT

7/18–7/19 **Applied Research in Acoustics**, R&D Scientist
Culpeper, Virginia. Developed physics-based signal processing algorithms for naval sonar systems. Processed acoustic signals using methods such as matched filtering, sparse estimation, and beamforming. Researched sound propagation and reverberation.

10/14–8/16 **J.P. Morgan/Neovest**, Software Development Engineer in Test
Orem, Utah. Developed Java-based automation software for J.P. Morgan's investment trading platform, Neovest. Created object-oriented unit tests to validate new features and locate software bugs.

9/12–12/12 **Bennett Aerospace**, Engineering Intern
Cary, North Carolina. Assisted in drafting a NASA SBIR solicitation. Helped design a crowd sourcing project for a biosensor device. Provided statistical analysis for a company staffing report.

CONSULTING

5/18–5/18 **Moog Music**: Audio effects development in C++ for digital sound synthesizers.

4/17–9/17 **Lofelt**: Audio algorithm development and mathematical modeling for audio-haptic devices, including the Razer Nari Ultimate headsets.

ACADEMIC RESEARCH ACTIVITIES

1/20– **University of California San Diego**, Ph.D. Student
La Jolla, California. Research areas: *acoustics, computer graphics, fluid dynamics*. Study computational geometric techniques for sound synthesis. Topics of interest include geometry reduction in room acoustics modeling, vortex filament dynamics in aeroacoustics simulations, and collision detection in solid object interactions.

1/17–8/17 **University of Edinburgh**, Master's Student
Edinburgh, Scotland. Research area: *acoustics*. Developed physics-based numerical simulations of speech and elastic solid vibrations with Stefan Bilbao. Simulation methods included modal synthesis and FDTD schemes.

1/10–9/13 **Wake Forest University**, Master's Student
Winston-Salem, North Carolina. Research areas: *optics, fluid dynamics*. Achieved the first known realization of transverse particle tracking in surface-isolated laser traps. Study topics included laser beam characterization, fluid diffusion, fluorescence microscopy, and particle tracking.

8/07–8/09 **Brigham Young University**, Undergraduate Student
Provo, Utah. Research areas: *biophysics, condensed matter physics*. Studied structural properties of biological materials using atomic force microscopy.

TEACHING EXPERIENCE

UCSD

MUS 6	Electronic Music—*TA*. Fall 2020 (1 term).
MUS 5	Sound in Time—*TA*. Spring 2020 (1 term). Student approval: 100%.
MUS 15	Music for Video Games—*TA*. Winter 2020 (1 term). Student approval: 100%.

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* (Steve Rotenberg)
MUS 270A	Digital Audio Processing (Tamara Smyth)
MUS 270B	Analysis of Musical Sound (Miller Puckette)
MUS 270D	Advanced Projects in Computer Music (Miller Puckette)
MUS 206	Deep Learning for Music Generation (Shlomo Dubnov)
MUS 206	Computational Acoustic Modeling (Tamara Smyth)
MUS 206	Pure Data Seminar (Miller Puckette)
MUS 267	Audio Software Programming (Tom Erbe)
MUS 272	Live Computer Music (Miller Puckette)
MUS 298	Directed Research (Shlomo Dubnov)

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).

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.