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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 and mathematical tools for simulating acoustic phenomena. 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, digital signal processing.
Thesis topic: computational geometric techniques for sound synthesis.
Mentors: Tamara Smyth, Shahrokh Yadegari, 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, applied mathematics, digital signal processing*. Study computational geometric techniques for sound synthesis. Topics of interest include spatial audio, structural acoustics, fluid dynamics, and differential geometry.
- 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 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 5 Sound in Time—*TA*. Spring 2020 (1 term). Student approval: 100%.
- MUS 6 Electronic Music—*TA*. Fall 2020 (1 term). Student approval: 100%.
- MUS 15 Popular Music: David Bowie—*TA*. Winter 2021 (1 term). Student approval: 92%.
- MUS 15 Popular Music: Video Game Music—*TA*. Winter 2020 (1 term). Student approval: 100%.
- MUS 172 Computer Music II—*TA*. Spring 2021 (1 term).

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

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| CSE 167 | Computer Graphics I (Jürgen Schulze) |
| CSE 169 | Computer Animation— <i>audit</i> (Steve Rotenberg) |
| CSE 274 | Discrete Differential Geometry (Albert Chern) |
| CSE 291 | Physical Simulation— <i>audit</i> (Steve Rotenberg) |
| CSE 299 | Differential Geometry Research (Albert Chern) |
| 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 206 | Deep Learning for Music Generation (Shlomo Dubnov) |
| MUS 206 | Computational Acoustic Modeling (Tamara Smyth) |
| MUS 206 | Spatial Audio (Shahrokh Yadegari) |
| MUS 298 | Spatial Audio Research (Puckette/Smyth/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.