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Chad McKell

ABOUT

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Summary — I am a Ph.D. student at UC San Diego working in the Department of Music and the Center for Visual Computing. In my research, I develop computational and mathematical tools for physical simulation and geometry processing. My research has applications in computer music, computer animation, virtual 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. Dissertation topic: computational geometric techniques for sound synthesis. 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

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. Mentors: Jonathan Botts and Douglas Abraham.
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, discrete differential geometry, and non-Euclidean geometry. Advisors: Albert Chern, Tamara Smyth, and Miller Puckette.
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. Simulation methods included modal synthesis and FDTD schemes. Advisor: Stefan Bilbao.
1/10–9/13	**Wake Forest University**, Master's Student Winston-Salem, North Carolina. Research areas: *optics, fluid dynamics.* Achieved the first known implementation of transverse particle tracking in surface-isolated laser traps. Study topics included laser beam characterization, fluid diffusion, fluorescence microscopy, and particle tracking. Advisor: Keith Bonin.
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. Advisor: David Busath.

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

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 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.