

Michele Kelley

615-812-7238 | mk3g@live.unc.edu | orcid 0000-0002-4024-2050

EDUCATION

University of North Carolina at Chapel Hill

Ph.D. in Physics and Astronomy

Chapel Hill, NC

Expected May 2023

University of North Carolina at Chapel Hill

M.S. in Physics and Astronomy

Chapel Hill, NC

May 2020

Middle Tennessee State University Honors College

B.S. in Physics and Astronomy

Minors: Mathematics and Aerospace

Murfreesboro, TN

December 2016

PUBLICATIONS

Kelley, M. & Branca, R. T. (2022) A simple setup for *in situ* alkali metal electronic spin polarimetry. *AIP Advances* *In production

Bryden, N. J., McHugh, C. T., **Kelley, M.**, Branca, R. T. (2022) Longitudinal relaxation of hyperpolarized ^{129}Xe in solution and in hollow fiber membranes at low and high magnetic field strengths. *Magnetic Resonance in Medicine*.

McHugh, C. T., Durham, P. G., **Kelley, M.**, Dayton, P. A., & Branca, R. T. (2021). Magnetic resonance detection of gas microbubbles via hyperCEST: A path toward dual modality contrast agent. *ChemPhysChem*, 22(12), 1219-1228.

Kelley, M., & Branca, R. T. (2021). Theoretical models of spin-exchange optical pumping: Revisited and reconciled. *Journal of Applied Physics*, 129(15), 154901.

McHugh, C. T., **Kelley, M.**, Bryden, N. J., & Branca, R. T. (2021). In vivo hyperCEST imaging: Experimental considerations for a reliable contrast. *Magnetic Resonance in Medicine*.

Bryden, N., Antonacci, M., **Kelley, M.**, & Branca, R. T. (2021). An open-source, low-cost NMR spectrometer operating in the mT field regime. *Journal of Magnetic Resonance*, 332, 107076.

Kelley, M., Burant, A., & Branca, R. T. (2020). Resolving the discrepancy between theoretical and experimental polarization of hyperpolarized ^{129}Xe using numerical simulations and in situ optical spectroscopy. *Journal of Applied Physics*, 128(14), 144901.

Antonacci, M. A., McHugh, C., **Kelley, M.**, McCallister, A., Degan, S., & Branca, R. T. (2019). Direct detection of brown adipose tissue thermogenesis in UCP1 $^{-/-}$ mice by hyperpolarized ^{129}Xe MR thermometry. *Scientific Reports*, 9(1), 1-12.

Pasquerilla, M., **Kelley, M.**, Mushi, R., Aguinaga, M. D. P., & Erenso, D. (2018). Laser trapping ionization of single human red blood cell. *Biomedical Physics & Engineering Express*, 4(4), 045020.

Kelley, M., Cooper, J., Devito, D., Mushi, R., del Pilar Aguinaga, M., & Erenso, D. B. (2018). Laser trap ionization for identification of human erythrocytes with variable hemoglobin quantitation. *Journal of Biomedical Optics*, 23(5), 055005.

Kelley, M., Gao, Y., & Erenso, D. (2016). Single cell ionization by a laser trap: a preliminary study in measuring radiation dose and charge in BT20 breast carcinoma cells. *Biomedical Optics Express*, 7(9), 3438-3448.

PRESENTATIONS

"In situ evidence of radiation trapping limiting Rb polarization in common SEOP setups" International Society of Magnetic Resonance in Medicine (2022) *poster presentation*

"Spin polarized ^{129}Xe for magnetic resonance imaging" UNC Graduate Student Colloquium (2022) *oral presentation*

"A closed-form expression for the spin-exchange cross section correctly predicts experimental Xe polarization values under SEOP" American Physical Society March Meeting (2022) *poster presentation*

"Magnetic resonance imaging with hyperpolarized xenon gas" Royster Society of Fellows Research Seminar (2022) *oral presentation*

"Revised form of the spin-exchange cross section correctly predicts experimental ^{129}Xe polarization values" Polarization in Noble Gases (2021) *oral presentation*

"In situ evidence of radiation trapping limiting Rb polarization in common continuous-flow SEOP setups" Polarization in Noble Gases (2021) *poster presentation*

"Resolving the discrepancy between theoretical and experimental polarization of HP ^{129}Xe using numerical simulations and optical spectroscopy" International Society of Magnetic Resonance in Medicine (2020) *poster presentation*

AWARDS AND SCHOLARSHIPS

Silver Award (2022) *Department of Physics and Astronomy*

National Science Foundation Graduate Research Fellow (2019)

Royster Fellow (2018) *most prestigious graduate fellowship at the University of North Carolina*

German Academic Exchange Service RISE Scholar (2016) *Institut für Angewandte Physik, Westfälische Wilhelms-Universität Münster*

The Society of Physics Students Service Award (2016) *Middle Tennessee State University*

Student Organization President of the Year (2016) *Middle Tennessee State University*

National Science Foundation International REU (2015) *Université Paris-Sud, Campus D'Orsay, Laboratoire Aimé Cotton*

The Theoretical Physics Award for Excellence (2015) *Middle Tennessee State University*

The Modern Physics Award for Excellence (2015) *Middle Tennessee State University*

Undergraduate Research Experience and Creative Activity Gold Grant (2015) *Middle Tennessee State University*

Benjamin A. Gilman International Scholarship (2014) *Prague, Czech Republic*

Buchanan Fellow (2012-2016) *1 of 20 Buchanan Fellows, the highest academic honor at Middle Tennessee State University*

SKILLS AND PROJECTS

Programming Languages: Mathematica, LabView, MATLAB, Python, C++

Applications: COMSOL Multiphysics, Fusion360, SOLIDWORKS, Git

Teaching: Introductory calculus-based physics with active learning based studio

Electronics: Skilled in basic RF circuit design (amplifiers, LC circuits, etc) and familiarity with NI DAQs, amplifiers, power supplies, oscilloscopes, etc.

NMR/MRI: Trained to operate Bruker BioSpec 9.4T scanner, programmed sequences on Bruker BioSpec 9.4T scanner for HP Xe, designed CW-NMR experiments, designed and constructed NMR coils

Lab built Xe polarizer (in progress)

Designing and constructing Xe polarizer. Wrote lab safety protocols for filling optical cells with alkali metals for spin exchange optical pumping experiments.

Alkali metal electronic spin polarimetry (Kelley et al 2022)

Designed and built diode laser system and light polarization detector. Operated and tuned high power lasers.

Theoretical models and measurements of Rb-Xe spin-exchange (Kelley et al. 2021)

Used quantum mechanics to derive expression for spin-exchange. Performed and analyzed NMR and optical spectroscopy measurements.

Finite element method simulations of optical pumping cells (Kelley et al. 2020)

Created CAD models of optical pumping cells and generated sophisticated fluid dynamic simulations in COMSOL. Utilized computing cluster.

SERVICE AND LEADERSHIP

Representative Trainee representative of ISMRM Hyperpolarized Media Study Group (2022)

Reviewer ISMRM abstract reviewer (2021)

Mentor Undergraduate researchers in Branca Lab

- James Crisp (Fall 2019 – Spring 2020) *“Finite element method simulations of extended body optical cells”*
- Yifeng Peng (Summer 2021) *“Construction of lock-in amplifier using operational amplifiers”*
- Yifeng Peng (Fall 2021 – Spring 2022) *“Computational fluid dynamics simulations of small animal ventilator”*

Leader APS Chapter at UNC Chapel Hill co-founder (Fall 2021-present)

- Instituted new graduate student colloquium

Leader “G2U” Graduate to Undergraduate Mentoring Program for URM (2020-present)

- One of the founding leaders of G2U, which has been featured Science magazine

Mentor “GrAM” Graduate Achievement through Mentorship Program (2020-2021)

Representative Graduate Studies and Affairs Committee (2018-2021)

Senator Graduate and Professional Student Government (2020)

President Physics and Astronomy Graduate Student Association (2019)

Mentor “RAMP” Royster Advanced Mentoring Program (2018-2019)

Volunteer Science is Awesome Day at UNC-Chapel Hill (2018)