WILLIAM & MARY
CHARTERED 1693

TYLER MELDRUM

Assistant Professor of Chemistry
Curriculum Vitae, May 2019

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Education

2006–2011 *University of California, Berkeley*
Lawrence Berkeley National Laboratory, Materials Sciences Division; Berkeley, California
Ph.D., Chemistry
Dissertation: *Xenon-based Molecular Sensors in Analytical Applications*

2004–2006 *Brigham Young University; Provo, Utah*
B.S., Biochemistry

1999–2001 *University of Colorado, Boulder*

Academic Positions

2013–present Assistant Professor, Department of Chemistry; *William & Mary*

2011–2013 Postdoctoral Research Fellow; *RWTH Aachen University (Aachen, Germany)*
Postdoctoral advisor: Prof. Bernhard Blümich

2010 Adjunct Faculty, Chemistry Department; *Contra Costa College; San Pablo, California*

Honors, Prizes, and Awards

2011 R&D 100 Award from R&D Magazine, *Magnetic Resonance Microarray Imaging*
Awarded for research and development of miniaturized, xenon-based chemical sensors

2010 Alexander von Humboldt Research Fellowship for Postdoctoral Researchers
Deutscher Akademischer Austauschdienst (DAAD) postdoctoral fellowship

2006 Office of Research and Creative Activities Research Grant, Brigham Young University
Physical Chemistry Student of the Year, Brigham Young University
Outstanding Teaching Assistant, Brigham Young University

2005 Departmental Research Grant, Brigham Young University
Outstanding Presenter, Undergraduate Research Conference, Brigham Young University

Courses Taught

2019 CHEM 302 (Physical Chemistry II, 53 students)
CHEM 304 (Integrated/Physical Chemistry Laboratory II; ~50 students)

2018 CHEM 302 (Physical Chemistry II, 49 students)
CHEM 304 (Integrated/Physical Chemistry Laboratory II; ~50 students)

2017 CHEM 302 (Physical Chemistry II, 47 students)

CHEM 303 (Integrated/Physical Chemistry Laboratory I; 8 students)
CHEM 304 (Integrated/Physical Chemistry Laboratory II; ~50 students)
CHEM 341 (Physical Chemistry for the Life Sciences, 14 students)

2016 CHEM 341 (Physical Chemistry for Life Sciences; 24 students)
CHEM 304 (Integrated/Physical Chemistry Laboratory II; 16 students)
CHEM 320 (Introduction to Chemical Research; 3 students)
CHEM 291, 409, 495 (Chemical Research; 11 undergraduate students total)

2015 CHEM 341 (Physical Chemistry for Life Sciences; 9 students)
CHEM 103 (General Chemistry I; 139 students)
CHEM 303 (Integrated/Physical Chemistry Laboratory I; 18 students)
CHEM 304/392 (Integrated/Physical Chemistry Laboratory II; 17 students)
CHEM 320 (Introduction to Chemical Research; 5 students)
CHEM 291, 409, 495 (Chemical Research; 11 students total)

2014 CHEM 103 (General Chemistry I; 150 students)
CHEM 303/391 (Integrated/Physical Chemistry Laboratory I; 35 students)
CHEM 392 (Physical Chemistry Laboratory II; 19 students)
CHEM 320 (Introduction to Chemical Research; 3 students)
CHEM 291, 409, 495 (Chemical Research; 8 students total)

2013 CHEM 103 (General Chemistry I; 100 students)
CHEM 391 (Physical Chemistry Laboratory I; 16 students)
CHEM 291 (Chemical Research; 3 students)

2010 CHEM 119 (Introductory Chemistry; 19 students)

Fellowships and Grants

2018 Small Business Technology Transfer (STTR) Phase II Grant
Method for Locally Measuring Strength of a Polymer-Inorganic Interface During Cure and Aging
Cooperative project between Metna Co. (Lansing, MI), Rutgers University (Newark, NJ), and William and Mary.
Oct 2018–Sept 2020; Total funding: $1,000,000. W&M portion: $150,000

2016 Faculty Summer Research Grant *(internal funding)*
Awarded for Summer 2017

2015 Colonial Williamsburg Foundation
Summer stipend for undergraduate research student; focus on analysis of dyed textiles
Summer 2015; $3450

2014 Faculty Summer Research Grant *(internal funding)*
Awarded for Summer 2014

American Chemical Society Petroleum Research Fund;
Undergraduate New Investigator Proposal:
Investigating the Development of Intermolecular Networks in Coatings with Single-sided NMR.
Awarded October 2014; $55,000

Publications (reverse chronological order)

Underlined names are William & Mary undergraduate students
Boldface names are William & Mary graduate students

15. King, J. N.; Fallorina, A.; Yu, J.; Zhang, G.; Telkki, V.-V.; Hilty, C; Meldrum, T. Probing molecular dynamics with hyperpolarized ultrafast Laplace NMR using a low-field, single-sided magnet. *Chem. Sci.* **2018,** 9, 6143–6149. *Open access.* doi:10.1039/C8SC01329B

14. Brass, M.; Morin, F.; Meldrum, T. Spatially Resolved Measurements of Crosslinking in UV-Curable Coatings Using Single-Sided NMR. *Magnetochemistry* **2018,** 4(1), 8. *Open access.* doi:10.3390/magnetochemistry4010008

13. Rehorn, C.; Kehlet, C.; Del Federico, E.; Zia, W.; Meldrum, T.; Blümich, B. Automatizing the Comparison of NMR Depth Profiles. *Strain* **2017,** e12254. doi:10.1111/str.12254

12. **Udell, N. A.;** Hodgkins, R. E.; Berrie, B. H.; Meldrum, T. Physical and chemical properties of traditional and water-mixable oil paints assessed using single-sided NMR. *Microchem. J.* 133, **2017,** 31–36. doi:10.1016/j.microc.2017.03.013

11. Fife, G.; Stabik, B.; Blu̇mich, B.; Hoppenbrouwers, R.; Meldrum, T. Evidence for the Accumulative Effect of Organic Solvent Treatments on Paintings and What to Do about It: A Case Study of Two "Identical" Seventeenth-Century Paintings Using Single-Sided Nuclear Magnetic Resonance; in The Noninvasive Analysis of Painted Surfaces: Scientific Impact and Conservation Practice; Nevin, A. and Doherty, T., Eds. *Smithsonian Contribution to Museum Conservation* 5(5), **2016,** 15–23. doi:10.5479/si.19492367.5

10. King, J. N.; Lee, V. J.; Ahola, S.; Telkki, V-V.; Meldrum, T. Ultrafast Multidimensional Laplace NMR Using a Single-sided Magnet. *Angew. Chemie Int. Ed.* 55, **2016,** 5040–5043. doi:10.1002/anie.201511859

9. Fife, G.; Stabik, B.; Kelley, A. E.; King, J. N.; Blumich, B.; Hoppenbrouwers, R.; Meldrum, T. Characterization of aging and solvent treatments of painted surfaces using single-sided NMR. *Magn. Reson. Chem.,* **2014,** 53, 58–63. doi:10.1002/mrc.4164

8. Garimella, P. D.; Meldrum, T.; Witus, L. S.; Smith, M.; Bajaj, V S.; Wemmer, D. E.; Francis, M. B.; Pines, A. Hyperpolarized Xenon-Based Molecular Sensors for Label-Free Detection of analytes. *J. Am. Chem. Soc.,* **2014,** 136, 164–168. doi:10.1021/ja406760r

7. Fukunaga, K.; Meldrum, T.; Zia, W.; Ohno, M.; Fuchida, T.; Blumich, B. Nondestructive Investigation of the Internal Structure of Fresco Paintings. In *2013 Digital Heritage International Congress (DigitalHeritage)* IEEE, **2013,** 1, 81–88. doi:10.1109/DigitalHeritage.2013.6743716

6. Meldrum, T.; Bajaj, V. S.; Wemmer, D. E.; Pines, A. Band-Selective Chemical Exchange Saturation Transfer Imaging with Hyperpolarized Xenon-Based Molecular Sensors. *J. Magn. Reson.,* **2011,** *213,* 14–21. doi:10.1016/j.jmr.2011.06.027

5. Meldrum, T.; Seim, K. L.; Bajaj, V. S.; Palaniappan, K. K.; Wu, W.; Francis, M. B.; Wemmer, D. E.; Pines, A. A Xenon-Based Molecular Sensor Assembled on an MS2 Viral Capsid Scaffold. *J. Am. Chem. Soc.* **2010,** *132,* 5936–5937. doi:10.1021/ja100319f

4. Meldrum, T.; Schröder, L.; Denger, P.; Wemmer, D. E.; Pines, A. Xenon-Based Molecular Sensors in Lipid Suspensions. *J. Magn. Reson.* **2010,** *205,* 242–246. (Cover article.) doi:10.1016/j.jmr.2010.05.005

3. Schröder, L.; Meldrum, T.; Smith, M.; Schilling, F.; Denger, P.; Zapf, S.; Wemmer, D. E.; Pines, A. Xenon Biosensors for Multi-Purpose Molecular Imaging. World Congress on Medical Physics and Biomedical Engineering, September 7–12, 2009, Munich, Germany. *IFMBE Proc.* **2009,** 25/13, 176–179.

2. Schröder, L.; Chavez, L.; Meldrum, T.; Smith, M.; Lowery, T. J.; Wemmer, D. E.; Pines, A. Temperature-Controlled Molecular Depolarization Gates in Nuclear Magnetic Resonance. *Angew. Chem. Int. Ed.* **2008,** *47,* 4316–4320. (Frontispiece.) doi:10.1002/anie.200800382

1. Schröder, L.; Meldrum, T.; Smith, M.; Lowery, T. J.; Wemmer, D. E.; Pines, A. Temperature Response of ^{129}Xe Depolarization Transfer and Its Application for Ultrasensitive NMR Detection. *Phys. Rev. Lett.* **2008,** *100,* 257603(4). doi:10.1103/PhysRevLett.100.257603

Presentations and talks

2019 University of Delaware; Newark, DE
A Little R&R: Single-sided Magnetic Resonance and Relaxation

2018 American Chemical Society National Meeting; Boston, MA
How Pigment/Binder Interactions Affect Single-sided NMR Measurements of Acrylic Paints

2017 American Chemical Society National Meeting; Washington, D.C.
Physical and Chemical Properties of Traditional and Water-mixable Oil Paints Assessed Using Single-sided NMR

New York University Abu Dhabi, United Arab Emirates
Invited speaker, *Scientific Research for Cultural Heritage* symposium

2017 Old Dominion University; Norfolk, VA
2016 Texas A&M University; College Station, TX
Brigham Young University; Provo, UT
Georgetown University; Washington, DC
departmental seminar talks, applications of single-sided NMR in cultural heritage research

2015 Harvard Art Museums; Cambridge, MA
Workshop on applications of single-sided magnetic resonance to cultural heritage problems
Leader/instructor

Experimental NMR Conference; Asilomar, CA
poster submission
"*T_2–D Studies of Biomolecular Interactions Using Single-sided NMR*"

SE/SW Joint Regional Meeting of the American Chemical Society; Memphis, TN
poster submissions (3):
"Characterization of historical lime mortar using single-sided nuclear magnetic resonance"
"Ultrafast two-dimensional relaxometry with single-sided NMR"
"Monitoring the development of intermolecular networks during the curing of coatings using single-sided NMR"

2014 The Non-Invasive Analysis of Painted Surfaces: Scientific Impact and Conservation Practice; Washington, D.C.
"Evidence for the accumulative effect of organic solvent treatments on paintings and what to do about it: A case study of two 'identical' 17th century paintings with single-sided NMR"
presentation available online at http://youtu.be/qDee6QUc0gg

2013 New techniques for the non-invasive investigation of the surface and subsurface structure of heritage objects; Toruń, Poland
invited speaker, "Of MOUSE and Men: Single-sided NMR in Cultural Heritage"

Ampere Summer School in Analyzing Cultural Heritage Using Portable Magnetic Resonance; Volterra, Italy
conference organizer, instructor
"Principles of NMR"

Experimental NMR Conference; Asilomar, California
poster submission
"Advancements in Stray-field NMR Relaxometry in Testing of Pipes, Soil, and Paintings"

2012 EUROMAR World Wide Magnetic Resonance Conference; Dublin, Ireland
poster presenter, travel stipend award recipient
"Contact-free Investigations of Master Paintings Using Single-sided NMR"

Gordon Conference, *Scientific Methods in Cultural Heritage Research*; West Dover, Vermont
poster presenter, travel stipend award recipient
"Contact-free Investigations of Master Paintings Using Single-sided NMR"

2011 Leibniz Institut für Molekulare Pharmakologie, Berlin
invited speaker
"*Optimization of CEST Contrast in Hyperpolarized Xenon Systems"*

2010 EUROMAR World Wide Magnetic Resonance Conference; Florence, Italy
promoted to oral presentation
"*A Xenon-based Molecular Sensor Assembled on an MS2 Viral Capsid Scaffold"*

2009 Gordon Conference, *Magnetic Resonance*; Biddeford, Maine
poster presenter, travel stipend award recipient
"Application of Multiple-pulse Saturation Transfer Sequences in hp-^{129}Xe NMR"

Experimental NMR Conference; Asilomar, California
poster presenter
"Multiplexing with Xenon Biosensors in a Macroscopically Homogeneous Phase"

2008 International Society for Magnetic Resonance in Medicine; Toronto, Canada
poster presenter, travel stipend award recipient
"Optimization of Xenon Biosensors for Increased Sensitivity"

Experimental NMR Conference; Asilomar, California
poster presenter
"Temperature Response of Functionalized Xenon Biosensors and Its Application to Ultra-sensitive NMR Detection"

Other professional contributions

2019 Graduate Research Symposium judge
Reviewer (1)

2018 Redeveloped CHEM 304 (Physical Chemistry Lab) pedagogy for Spring2019
Reviewer (2)
Presenter at the Associate Provost for eLearning Panel, *Using Infographics*

2017 Consultant for the U.S. Department of Defense (Gunpowder, Maryland; single-sided NMR)
Reviewer (1)
Panelist for the University Teaching Project Workshop "*Digital Creative Projects: Designing and Assessing Technology-based Assignments"*
Member of the consulting committee to hire a science librarian

2016 Developed Speed of Sound (statistical mechanics) experiment for CHEM 304
Member of the engineering steering committee at W&M
Reviewer (1)

2015 Developed Differential Scanning Calorimetry experiment for CHEM 303
Department representative at SERMACS (regional ACS conference) graduate student fair
Faculty search committees (2)
Reviewer (3)

2014 Faculty search committee
Reviewer (4)

Outreach activities

2019 Chemistry Magic Show presenter at the Williamsburg Regional Library
Host for high-school tour of department

2018 Presenter/host for various programs at the Williamsburg Regional Library
Forensic Science panelist, program for youth
Chemistry Magic Show
Simmer and Sear (chemistry of cooking), program for adults
Thankful for Chemistry, STEAM Saturday program for children

2017 Volunteer/guest speaker at Williamsburg Regional Library
Eating molecules, a science program for children ages 7–12
Science fair judge, Jamestown High School

2016 Volunteer/guest speaker at Williamsburg Regional Library
Energy and You!, a science program for children ages 7–12

2015 Volunteer/guest speaker at Williamsburg Regional Library
Light and Color, a science program for children ages 8–12

Invited panelist
Vaccinate! Because, Science!! Hosted by the W&M Graduate Student Assembly