

CURRICULUM VITAE

Contact Information & Public Profiles

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https://chem.mst.edu/media/academic/chem/documents/quadcharts/QuadChart_Woelk.pdf

Education

“Habilitation” (formerly required for securing tenure in Germany) in Physical Chemistry, Thesis: *Toroid Cavity Detectors in NMR Spectroscopy and NMR Microscopy*, University of Bonn, Germany

PhD, *Summa cum laude*, Physical Chemistry, University of Bonn, Germany, Thesis: *Induced Nuclear Spin Polarization During Catalytic Hydrogenations with Parahydrogen* (advisor: Joachim Bargon)

M.S. in Chemistry, *Summa cum laude*, University of Bonn, Germany, Thesis: *Nuclear-Magnetic-Resonance Investigations of Chemical Reactions with Spin-Polarized Hydrogen* (advisor: Joachim Bargon)

B.S. in Chemistry, *Summa cum laude*, University of Bonn, Germany

Employment

2014 – 2016 Associate Department Chair, Chemistry, Missouri S&T

2011 – 2014 Interim Department Chair, Chemistry, Missouri S&T

2009 – 2011 Assistant Department Chair, Chemistry, Missouri S&T

2003 – present Tenured Associate Professor, Chemistry, Missouri S&T (formerly: University of Missouri-Rolla (UMR))

2000 – 2003 Associate Professor, Physical Chemistry, University of Bonn, Germany

1994 – 2000 Assistant Professor, Physical Chemistry, University of Bonn, Germany

1992 – 1994 Postdoctoral Research Associate, Chemical Technology Division, Argonne National Laboratory, Argonne, IL

1988 – 1992 Graduate Teaching/Research Assistant, Physical Chemistry, University of Bonn, Germany

Administrational and Professional Responsibilities

2016 – present Coordinator, General Chemistry Laboratory Education, Missouri S&T

2015 Conference Organization & Fundraising, 2nd Branson NMR Meeting (January 17-18, 2015)

2014 – 2016 Team Leader, General Chemistry Blended Laboratory Course Redesign, Missouri S&T

2014 Conference Organization, 1st Branson NMR Meeting (February 22-23, 2014)

2014 Conference Organization and Chairman, LEAD@S&T, Missouri S&T

2011 – 2013 Team Leader, General Chemistry I Buffet-Model Course Redesign, Missouri Course Redesign Initiative, Missouri Learning Commons & National Center for Academic Transformation (NCAT)

2011 – 2012 Scholar, Leadership Development Program (LDP), University of Missouri System, Columbia, MO

2011 Acting Director, Freshman Faculty Forum (FFF), Missouri S&T

2009 – present Director, Institute for Applied Chemistry and Nuclear Magnetic Resonance, Missouri S&T

2009 – present Division Head, Physical Chemistry, Missouri S&T

2006 Symposium Organization, 16th Annual Teaching Renewal Conference, University of Missouri, Columbia, MO

2005 – 2009 Coordinator, General Chemistry Education, UMR/Missouri S&T

2005 – 2006 UMR Acting Director, New Faculty Teaching Scholarship (NFTS) program, University of Missouri System, Columbia, MO

2001 Symposium Organizer and Chairman, 21st Nordrhine-Westfalia Spring Symposium on Magnetic Resonance, University of Bonn, Germany.

Membership and Offices in Professional Societies

American Chemical Society, Physical Chemistry Division

Salute to Excellence Award “Continued Contribution to the American Chemical Society” (2011)

Treasurer, South Central Missouri Local Section (2007 – 2012)

Chairman, South Central Missouri Local Section (2006)

German Chemical Society (GDCh), Magnetic Resonance Spectroscopy Division

Research Fellowships & Awards

- "Make a Difference" Award, Society of American Military Engineers (SAME), Fort Leonard Wood, MO (2014)
— *single award given annually*
- Nobel Laureate Richard R. Ernst Award for "Best Subscribed Manuscript and Breakthrough in NMR Spectroscopy", German Chemical Society (GDCh) (2002)
— *three awards given annually*
- Visiting Scientist, Chemical Technology Division, Argonne National Laboratory, Argonne, IL (*Summer Appointments 1995, 1997, 1998, 1999, 2001*)
- R&D100 Award "Toroid Cavity Imager", R&D Magazine, Rockaway, NJ (1994)
- Outstanding Achievement Award, Argonne National Laboratory, Argonne, IL (1994)
- Geheimrat Dr. Edmund ter Meer PhD Thesis Award, University of Bonn, Germany (1992)
— *single award given annually*
- Research Group Scholar "Spectroscopy with Isolated and Condensed Molecules", German Research Foundation (DFG) (1991 – 1992)
- Graduate Fellowship, Konrad Adenauer Foundation, Sankt Augustin, Germany (1989 – 1991)
- Heinrich Hörlein Memorial Master's Thesis Award, University of Bonn, Germany (1989)
- Theodor Laymann Master's Fellowship, University of Bonn, Germany (1987 – 1988)

Teaching Fellowships & Awards

- Outstanding Teacher Award, Committee for Effective Teaching (CET), Missouri S&T (2020)
- Faculty Teaching Award, Missouri S&T (2020, 2017, 2010)
— *inaugural year (2010), maximum of eight awards given annually*
- Wilbur Tappmeyer Excellence in Teaching Undergraduates Award, Chemistry Department, UMR/Missouri S&T (2019, 2007)
- Excellence in Teaching Graduate-Level Courses, Chemistry Department, Missouri S&T (2014, 2009)
- Missouri Learning Commons Scholar, Missouri Learning Commons, Columbia, MO (2013)
— *inaugural year, four scholars elected*
- President's Award for Innovative Teaching, University of Missouri System, Columbia, MO (2011)
— *inaugural year, single award given annually*
- "We love your class" Award, Freshman Engineering, Missouri S&T (2009, 2008)
- Faculty Teaching Scholar, Office for Undergraduate and Graduate Studies, UMR (2008)

Service Awards

- Faculty Service Award, Missouri S&T (2017)
— *maximum of 4 awards given annually*
- Outstanding Contribution to Service Award, Chemistry Department, Missouri S&T (2017)

Recent Media Coverage and Public Reports

- "Labs don't stop for pandemics" <https://news.mst.edu/2021/03/labs-dont-stop-for-pandemics/> (published March 29, 2021).
- "New chemistry online labs show teaching, learning success" <https://econnection.mst.edu/2020/09/new-chemistry-online-labs-show-teaching-learning-success/> (published September 1, 2020)
- "How to livestream your lab – Woelk shares best practices" <https://econnection.mst.edu/2020/03/how-to-livestream-your-lab-woelk-shares-best-practices/> (published March 26, 2020)
- "Affordable and Open Educational Resources | UM System" <https://www.youtube.com/watch?v=Lt9oal5FPM> (published June 30, 2018).
- Blended Chemistry Lab at Missouri S&T, <https://www.youtube.com/watch?v=NHTeXINX6Lk>, Missouri S&T (published February 1, 2016).

Recently Funded Research Projects

- M. Fitch, K. Woelk, Lignocellulosic Determination for a Biochemical Reactor Treating Mine Impacted Water, Alloy Group, \$8,800, Co-PI, 11.6%, 03/14/2022 – 09/01/2022.
- J. Huang, K. Woelk, OBI: Acquisition of Preliminary Data to Support NIH Resubmission Proposal for Turbo Mohs with Novel Acupuncture-MRI Probe, \$12,500, PI, 40%, 04/01/2018 – 03/31/2019.
- K. Woelk, High-resolution NMR Relaxometry for the Characterization of Fluid Flow in Porous Materials, Materials Research Foundation, \$5,000, PI, 100%, 01/01/2018 – 12/31/2019.
- K. Woelk, Molecular Hydrocarbon and Water Adsorption on Clay Minerals and Solid Organic Matter, Argonne Nat'l Lab, Chevron Corporation, \$164,077, PI, 100%, 06/15/2013 – 09/30/2015.

Recently Funded Teaching and Learning Projects

- J. P. Hogan, K. Woelk, Evaluating the Impact of 3D-Virtual Representations in Achieving Object-Based Learning Outcomes Across Diverse Learning Environments, Missouri S&T Provost's eFellows Program (52%), Missouri S&T Department of Geosciences and Geological and Petroleum Engineering (39%), Missouri S&T Department of Chemistry (9%), \$9574.95, PI, 50%, 08/01/2020 – 05/31/2021.
- K. Woelk, UM System Affordable & Open Educational Resources (A&OER) initiative award to convert CHEM 3410 (Chemical Thermodynamics) to OER, \$11,000, PI, 100%, 05/01/2018 – 04/30/2019
- K. Woelk, S. B. Burchett, Analysis of Student Success in a Blended Laboratory Course by Trend Analysis in a Parallel Lecture Course, Missouri S&T Educational Research Grant, \$4,050, PI, 100%, 08/01/2015 – 12/31/2016.
- K. Woelk, CHEM 1319 Lab Redesign Full Implementation, Missouri S&T (50%) & The Missouri Learning Commons (50%), \$65,000, PI, 100%, 07/01/2015 – 05/31/2016.
- K. Woelk, S. B. Burchett, Optimizing Institution Resources by Introducing a Blended Component in Chem 2, Missouri S&T Provost's eFellows Program (50%), Missouri S&T Chemistry Department (50%), \$10,000, PI, 100%, 08/01/2014 – 05/31/2016.

Recent Peer-Reviewed Scholarly Contributions

- N. T. Moon, K. Woelk, G. S. Grubbs II, Construction and Demonstration of a 6–18 GHz Microwave Three-Wave Mixing Experiment Using Multiple Synchronized Arbitrary Waveform Generators, *Symmetry* **2022**, *14*, 848.
— *Featured Article and Cover Art*
- A. Priester, R. Waters, A. Abbott, K. Hilmas, K. Woelk, H. A. Miller, A. W. Tarudji, C. C. Gee, B. McDonald, F. M. Kievit, A. J. Convertine, Theranostic Copolymers Neutralize Reactive Oxygen Species and Lipid Peroxidation Products for the Combined Treatment of Traumatic Brain Injury, *Biomacromolecules* **2022**, *23*, 1703–1712.
- K. Woelk, P. D. Whitefield, As close as it might get to the real lab experience – Live-streamed laboratory activities, in “Insights Gained While Teaching Chemistry in the Time of COVID-19” (Special Issue), *J. Chem. Educ.* **2020**, *97*, 2996-3001.
- M. Huang, S. Chen, J. Huang, R. E. Gerald II, K. Woelk, NMR Studies of Materials Loaded into Porous-Wall Hollow Glass Microspheres, *Mater. Sci. Eng. C* **2020**, *116*, 111177.
- T. R. McDowell, E. T. Schmittzehe, A. J. Duerden, D. Cernusca, H. Collier, K. Woelk, A Student-Choice Model to Address Diverse Needs and Promote Active Learning, *J. Sci. Educ. Technol.* **2019**, *28*, 321-328.
- L. Chi, M. Huang, A. R. Pfaff, J. Huang, R. E. Gerald II, K. Woelk, Capillary-tube package devices for the quantitative performance evaluation of nuclear magnetic resonance spectrometers and pulse sequences, *Rev. Sci. Instrum.* **2018**, *89*, 123115.
- A. R. Pfaff, K. Woelk, A Fast and Convenient Way to Predict Relaxation during a Frequency-selective Adiabatic Hyperbolic Secant Pulse (HS1 Sech Pulse), *Appl. Magn. Reson.* **2018**, *49*, 479-491.
- A. R. Pfaff, C. McKee, K. Woelk, Predicting the Effect of Relaxation during Frequency-selective Adiabatic Pulses, *J. Magn. Reson.* **2017**, *284*, 99–103.
- A. J. Mundahl, S. P. Berg, J. L. Rovey, M. Huang, K. Woelk, D. V. Wagle, G. Baker, Characterization of a Novel Ionic Liquid Monopropellant for Multi-Mode Propulsion, *AIAA Propulsion and Energy Forum*, (AIAA **2017-4756**).
- S. B. Burchett, A. R. Pfaff, J. L. Hayes, K. Woelk, Exploding Misconceptions: Developing a Culture of Safety through Learner Driven Activity, *J. Chem. Health Saf.* **2017**, *24*, 36-42.
- T. R. McDowell, E. T. Satterfield, K. Woelk, H. Collier, Fostering a Positive Collaborative Learning Experience in an Optional Student Success Program, *J. Mod. Educ. Rev.* **2016**, *6*, 561–567.

Patents

- M. Huang, L. Chi, R. E. Gerald II, J. Huang, A. R. Pfaff, K. Woelk, In situ NMR Parameter Monitoring Systems and Methods for Measuring pH and Temperature, US Patent 10,295,487 (issued May 21, **2019**).
- L. Chi, M. Huang, R. E. Gerald II, K. Woelk, Solid State NMR Spectroscopy/Imaging in situ Measuring Devices and Methods for Calibration and Determining one or more Quantitative Properties of a Target Sample, US Patent 10,067,079 (issued September 4, **2018**).
- D. A. Summers, K. Woelk, K. D. Oglesby, G. Galecki, Method and Apparatus for Jet-Assisted Drilling or Cutting, US Patent 8,475,230 (issued July 2, **2013**).
— *licensed to Impact Technologies, Rochester, NY (2012 – 2016)*
- H. G. Niessen, K. Woelk, A. Eichhorn, J. Bargon, Colloid-Catalyzed Gas Transfer in Supercritical Phases, European Patent EP 1404725 B1 (issued November 18, **2005**) & US Patent 7,193,120 (issued March 20, **2007**).
- J. W. Rathke, R. J. Klingler, K. Woelk, R. E. Gerald II, Near Electrode Imager, US Patent 6,046,592 (issued April 4, **2000**).
- K. Woelk, J. W. Rathke, R. J. Klingler, Nuclear Resonance Tomography with a Toroid Cavity Detector, US Patent 5,574,370 (issued November 12, **1996**).

Recent Poster Presentations

- R. M. Herndon, Z. G. Mayes, M. Abdelrahman, K. Woelk, Characterization of Pyrolysis Oils for Asphalt Fortification, ACS Midwest Regional Meeting (MWRM2022), Iowa City, IA (October 19-21, **2022**).
- H. M. Bahn, Z. G. Mayes, K. Woelk, Interactions of Hydrogen Gas with Cu-ZnO/Al₂O₃ Catalysts Used in Industrial Methanol Synthesis, ACS Midwest Regional Meeting (MWRM2022), Iowa City, IA (October 19-21, **2022**).
- Z. G. Mayes, K. Woelk, Development and analysis of ringdown-free T_1 relaxation methods, ACS Midwest Regional Meeting (MWRM2022), Iowa City, IA (October 19-21, **2022**).
- R. M. Herndon, Z. G. Mayes, M. Abdelrahman, K. Woelk, Characterization of Pyrolysis Oils for Asphalt Fortification, Graduate Women in Science, 2022 Annual National Conference, Madison, WI (June 25, **2022**).
- C. R. Murray, R. M. Herndon, Z. G. Mayes, M. Abdelrahman, K. Woelk, Characterization of Pyrolysis Oils for Asphalt Fortification, 2022 Missouri Academy of Science Annual Meeting, Fayette, MO (April 23, **2022**).
- A. Q. Hermelink, H. M. Bahn, Z. G. Mayes, K. Woelk, Investigating Industrial Methanol Production with Nuclear Magnetic Resonance Relaxometry, 2022 Missouri Academy of Science Annual Meeting, Fayette, MO (April 23, **2022**).
- G. A. Riddle, Z. G. Mayes, K. Woelk, The Influence of Dissolved Metal Ions on Nuclear Magnetic Relaxation Times in Aqueous Solutions, 2022 Missouri Academy of Science Annual Meeting, Fayette, MO (April 23, **2022**).
- M. R. Sly, L. M. Kehoe, B. Salunkhe, T. P. Schuman, K. Woelk, Chemical-shift-resolved High-resolution NMR Relaxometry of Polymer Hydrogels, ACS Midwest Regional Meeting (MWRM2021), Springfield MO (October 20-22, **2021**).
- M. Parker, L. J. Albrecht, M. Huang, J. Huang, R. E. Gerald II, K. Woelk, Low-Cost Solution for Optically Induced NMR Hyperpolarization, Undergraduate Research Conference, Missouri S&T, Rolla, MO (April 16, **2019**).
- K. E. Brakensiek, K. Woelk, Relaxation of Hyperpolarized Nuclear Magnetic Resonance (NMR) Spin States, 51st Annual Southeastern Undergraduate Research Conference (SURC), University of Tennessee, Martin, TN (February 7-8, **2019**).
- M. Huang, M. Parker, K. Woelk, J. Huang, R. E. Gerald II, Simple Laser System for Hyperpolarized NMR Experiments, 51st Annual Southeastern Undergraduate Research Conference (SURC), University of Tennessee, Martin, TN (February 7-8, **2019**).

Recent Research Talks and Conference Lectures

- K. Lai, K. Woelk, Refinement of Relaxation Coefficients in Nuclear Magnetic Resonance, 2022 Missouri Academy of Science Annual Meeting, Fayette, MO (April 23, **2022**).
- A. Q. Hermelink, K. Woelk, NMR Relaxometry of Syngas-to-methanol Conversion, Undergraduate Research Conference, Missouri S&T, Rolla, MO (April 14, **2022**).
- *Second Place, Sciences Oral Presentations*
- K. Woelk, Materials Characterizations Using High-resolution NMR Relaxometry, Department of Chemistry and Biochemistry, Kennesaw State University, Kennesaw, GA (February 2, **2022**).
- Z. G. Mayes, M. R. Sly, P. O. Aina, K. Woelk, RAPTOR – Rapid Acquisition Pulse-Train for Observing Relaxation in NMR, ACS Midwest Regional Meeting (MWRM2021), Springfield, MO (October 22, **2021**).
- K. Woelk, High-resolution NMR relaxometry with a benchtop NMR spectrometer, ACS Midwest Regional Meeting (MWRM2021), Springfield, MO (October 21, **2021**).
- L. M. Kehoe, M. R. Sly, B. P. Salunkhe, T. J. Schuman, K. Woelk, Chemical-shift Resolved High-resolution Nuclear Magnetic Resonance Relaxometry of Polymer Hydrogels, 2021 Missouri Academy of Science Annual Meeting, Columbia, MO (April 24, **2021**).
- M. R. Sly, K. Woelk, Chemically Resolved Nuclear Spin Relaxation, Undergraduate Research Conference, Missouri S&T, Rolla, MO (April 14, **2021**).
- K. E. Brakensiek, K. Woelk, Nuclear Spin Relaxation in NMR Spectroscopy, Undergraduate Research Conference, Missouri S&T, Rolla, MO (April 16, **2019**).
- *First Place, Sciences Oral Presentations*
- K. M. Lee, K. Woelk, Optimizing D₂O/H₂O Ratio for NMR pH Measurements, Undergraduate Research Conference, Missouri S&T, Rolla, MO (April 16, **2019**).
- *Second Place, Sciences Oral Presentations*
- L. M. Kehoe, M. Huang, R. E. Gerald II, K. Woelk, Saturation-transfer Difference Nuclear Magnetic Resonance (NMR) Experiments to Probe into Interactions Between Small Molecules and Colloidal Polymers, 51st Annual Southeastern Undergraduate Research Conference (SURC), University of Tennessee, Martin, TN (February 8, **2019**).
- E. L. Wideman, L. M. Kehoe, L. Chi, M. Huang, B. Gamelin, R. E. Gerald II, K. Woelk, T_1 CapPack™ (Capillary-tube Package) Devices for Determining the Effects of Spin-Lattice Relaxation on Nuclear Magnetic Resonance (NMR) Pulse Sequences, 51st Annual Southeastern Undergraduate Research Conference (SURC), University of Tennessee, Martin, TN (February 8, **2019**).

Courses Taught

Courses taught include lectures and lab instructions in general, physical, and analytical chemistry. Enrollment numbers varied from 20 to 70 students in sophomore- and junior-level physical-chemistry courses to about 450 in general-chemistry lectures for majors and non-majors. Typical enrollment in graduate-level courses was between 5 and 15 students.

Undergraduate Courses (Grundstudium), University of Bonn:

Physical Chemistry I-IV (Structure of Matter, Thermodynamics, Kinetics, Spectroscopy); Physical Chemistry I (Structure of Matter) for secondary-education majors; Modern Methods in Physical Chemistry; Instrumental Analysis

Graduate Courses (Hauptstudium), University of Bonn:

The Physics of Modern Spectroscopic Methods in Chemistry; Modern Methods of NMR Spectroscopy and Imaging + Lab; Advanced Instrumental Analysis + Lab; Advanced Physical Chemistry Lab; Principles of Catalysis

Undergraduate Courses, Missouri S&T:

Orientation for Chemistry Majors; Introduction to Laboratory Safety and Hazardous Materials; General Chemistry I; General Chemistry Laboratory; Chemical Thermodynamics; Practical Aspects of Nuclear Magnetic Resonance

Graduate Courses, Missouri S&T

Advanced Chemical Thermodynamics; Chemical Spectroscopy; Quantum Chemistry; Advanced NMR Spectroscopy

Advisement and Mentorship (beyond degree-program advisement of undergraduates)

<u>Visiting Scientists:</u>	Argonne National Laboratory (2)
<u>Postdoctoral Trainee:</u>	University of Amsterdam, The Netherlands (1)
<u>Ph.D. Students:</u>	Theses in NMR Spectroscopy and Imaging (10), Chemical Catalysis (3), Chemical Education (2), Drug Delivery (1)
<u>Master's Students:</u>	Theses in NMR Spectroscopy and Imaging (4); Non-Thesis (5)
<u>Visiting Graduate Students:</u>	The University of Queensland, Australia (1), Technical University Munich, Germany (1)
<u>Graduate Committees:</u>	Departments: Chemistry (24), Geosciences (2), Physics (1), Material Sciences (1), Electrical Engineering (1), Nuclear Engineering (1)
<u>Undergraduate Students:</u>	Research Honor's thesis (1); OURE (Opportunity for Undergraduate Research Experience, https://undergrad.mst.edu/experientiallearning/oure/) in Chemistry (15), Chemical and Biological Engineering (5), Biological Sciences (2), Physics (1), Computer Science (1), Mechanical Engineering (1), Architectural Engineering (1), English and Technical Communications (1); OURE Fellowship in Architectural Engineering (1); FYRE (First Year Research Experience, https://case.mst.edu/research/fyre/) in Chemistry (3), Physics (1); Summer Research Scholarship in Chemistry (4); Summer Research Internship in Chemistry (3); Research for Credit (14); Research Co-op for Credit (3); Research Volunteers (9)
<u>High-School Students:</u>	Summer Research Internship in Chemistry (5); Science Paper and Project Support (1)
<u>Middle-School Students:</u>	Science Olympiad Project Support (3)