

Thomas Theis, PhD

Assistant Professor of Chemistry, Physics and BME
ttheis@ncsu.edu 510-363-2368

lab page: <https://theislab.wordpress.ncsu.edu/>

NC STATE
UNIVERSITY

Education

- **Post-doc** *Chemistry, Physics, BME and Molecular Imaging* at Duke University **2012-2015**
 - Advisor: Warren S. Warren, James B. Duke Professor of Chemistry, Physics, Radiology, BME.
 - “Molecular spin systems to maintain long-lived hyperpolarization”
- **Ph.D.** *Physical Chemistry, NMR and MRI* at University of California, Berkeley **2007-2012**
 - Advisor: Alexander Pines, Glenn T. Seaborg Professor of Chemistry
 - Thesis title: “Advances in Zero-Field Nuclear Magnetic Resonance Spectroscopy”
- **Diplom (M.Sc.)** *Chemistry* at University of Göttingen, Germany **2006**
 - Advisor: Michael Buback, Professor of Technical and Macromolecular Chemistry
 - Thesis title: “Polymerization Kinetics Studied with NIR and ESR Spectroscopy”

Professional Experience

Assistant Professor at North Carolina State University, Department of Chemistry **2018-present**

- Development of Hyperpolarization Chemistry and Spin Physics for Next-Generation Biosensing.

Adjunct Assistant Professor at UNC & NCSU Joint Dept. of Biomedical Engineering **2019-present**

- Development of Hyperpolarized MRI Technology.

Adjunct Assistant Professor NC State Department of Physics **2020-present**

- Development of RASER for Precision Measurement, and Quantum Sensors for Nanoscale NMR.

Assistant Research Professor at Duke University **2016-2018**

- Lead of the NMR and MRI research team in the Center of Molecular and Biomolecular Imaging.
- Development of versatile hyperpolarized molecular markers and simple hyperpolarization technology.
- Close collaboration with Prof. Eduard Chekmenev at Vanderbilt University (now at Wayne State).
- Close collaboration with Prof. Matthew Rosen at MGH and Harvard Medical School.

Post-doctoral Associate at Duke University **2012-2015**

- Investigated long-lived singlet states in complex systems and implications for hyperpolarized MRI

Visiting Professor at RWTH Aachen University **2013**

- Investigated parahydrogen-hyperpolarized long-lived states as *Theodore-von-Kármán-Fellow*, upon invitation by Prof. B. Blümich and Prof. S. Appelt.

Graduate Student Researcher at UC Berkeley & Lawrence Berkeley National Laboratory **2007-2012**

- Developed “*zero-field NMR spectroscopy*”. Work performed in collaboration with Budker lab at UC Berkeley and the Kitching lab at the National Institute of Science and Technology (NIST).

European Graduate School Fellow at University of Göttingen & Max Planck Institute for Biophysical Chemistry **2006-2007**

- Studied polymerization kinetics with NIR and ESR spectroscopy (Buback lab).
- Examined energy transfer through molecular chains with femto-second lasers (Trope lab).

Education Abroad Scholar at UC Santa Cruz **2004-2005**

- Synthesized limonene based β -amino-alcohols for enantioselective catalysis (Singaram lab).
- Synthesized and characterized gold nanoparticles to study electron transfer chemistry. (Chen lab).

Professional Activities and Honorary Positions

- NC State Department of Chemistry Committee Memberships: **2019-present**
 - Diversity, Equity & and Inclusion Committee
 - Safety Committee
 - Undergraduate Programs Committee
 - Admissions Committee
- Guest Editor for ChemPhysChem, Special Edition on Parahydrogen Enhanced Resonance **2020**
- Co-Lead Organizer of the Physical Chemistry Seminar Series **2020-present**
- Member, NC State Chemistry of Life Program (CLP) **2020-present**
- External PhD committee member, University of Sydney, Australia **2020**
- Chair and Lead Organizer of the annual Parahydrogen Enhanced Resonance Meeting (PERM) **2020/21**
- Start-up Founder and President of Vizma Life Sciences LLC **2019-present**
- Scientific Advisory Committee of the HYP2020 conference in Lyon, France **2019**
- Member, Sigma Xi, the Scientific Research Honour Society **2019-present**
- External PhD committee member, DTU (Danish Technical University), Denmark **2019**
- External PhD committee member, University of Southampton, UK **2019**
- External PhD committee member, RWTH Aachen University, Germany **2019**
- Chair, Hyperpolarization Methods & Equipment Study Group of the ISMRM **2018-2019**
- Vice Chair, Hyperpolarization Methods & Equipment Study Group of the ISMRM **2017-2018**
- Secretary, Hyperpolarization Methods & Equipment Study Group of the ISMRM **2016-2017**
- Member, International Society for Magnetic Resonance in Medicine (ISMRM) **2013-present**
- Member, American Association for the Advancement of Science (AAAS) **2013-present**
- Member, American Chemical Society (ACS) **2012-present**

Awards and Honors

- Goodnight Early Innovator Award, \$60,000 **2021**
- Ampere Prize for Young Investigators: “Rising Stars in Magnetic Resonance” **2020**
- NC IDEA Seed Grant for Hyperpolarization Lab startup, Vizma Life Sciences, \$50,000 **2020**
- Brain Initiative Exploratory R01: Proof of Concept Development of Early Stage Next Generation Human Brain Imaging: “*Molecular MRI of Brain Metabolism*”, PI, \$807,000 **2020**
- Internationalization Seed Grant, NC State - RWTH Aachen - University of Stuttgart, PI, \$5,000 **2020**
- Edward Mallinckrodt Junior Faculty Grant, PI, \$180,000 direct cost **2019**
“*Affordable Molecular Imaging with Long-Lived Hyperpolarized Spin States to Under-stand, Diagnose and Treat Metabolic Disease*”
- North Carolina Biotechnology Center Translational Research Grant, PI, \$110,000 direct cost **2019**
“*Democratization and Disruption of Biomedical Imaging with Simple Hyperpolarized Biotracers*”
- Ralph E. Powe Junior Faculty Enhancement Award, PI, \$10,000 direct **2019**
“*Mapping In Vivo Metabolism with Long-lived Hyperpolarized Quantum States*”
- NIH-R21-Trailblazer Award, PI, \$400,000 direct cost **2017**
“*Molecular imaging of in vivo metabolism with a hyperpolarized vitamin shot*”
- NSF-CHE Grant as co-PI (Professor Warren Warren, PI), \$650,000 total cost **2017**
“*Improving, Understanding, Utility and Generality of Hyperpolarized, Long-lived Spin States in MR*”
- Duke Arts & Sciences Collaborative Research Grant with MIT and Harvard, PI, \$5,000 **2017**
“*Mapping In Vivo Metabolism with Long-lived Hyperpolarized Quantum States*”
- Duke Arts & Sciences Collaborative Research Grant with MGH and Harvard, PI, \$5,000 **2016**
“*Biomolecular Imaging for Everyone*”
- Top Story in *NSF Science 360 News* & Research Highlight in the *Boston Globe* for **2016**

“New class of molecular ‘lightbulbs’ illuminate MRI” (published in *Science Advances*)

- Magnetic Resonance in Chemistry - Young Scientist Award, for “Enhancing SABRE with microTesla fields” **2015**
- ACS New Directions Grant as co-PI with Prof. Volker Blum : \$110,000 **2015**
“Dynamics of Molecules and Spins in Nuclear Magnetic Resonance for Imaging and Oil Borehole Applications”
- Duke Pratt School of Engineering Seed Grant, \$40,000 **2014**
“Dynamics of Coupled Spins in NMR for Biomolecular Imaging and Chemical Analysis”
- International travel funds from the German Science Foundation (DFG) **2014**
“Invivo tumor imaging with parahydrogen”
- “Spotlight on Exceptional Research” by the American Physical Society for the discovery of “Long-Lived Heteronuclear Spin-Singlet States in Liquids at Zero Magnetic field”. **2014**
- Theodore-von-Kármán-Fellowship for visiting professors at the RWTH Aachen University. **2013**
- “Spotlight on Exceptional Research” by the APS for “Magnetic Scans with a tiny Magnet”. **2011**
- Nature Research Highlights: “NMR without the magnet”: *Nature* (2011), 473, 126. **2011**
- Nature Physics News and Views: “The art of signal enhancement”: *Nat. Phys.* (2011), 7, 522–523. **2011**
- European Graduate School Fellowship at the University of Göttingen: “Microstructural control in free-radical polymerization”. **2006**

Languages

- Fluent in English, Spanish, and German; proficient in French.

Teaching Experience

Professor and Mentor at North Carolina State University **2018-present**

- Designed *Gamification of the Physical Chemistry Curriculum* at NC State.
- Designed and Taught *Spin Dynamics Summer Course*, Summer 2021
- Designed and Taught *Introduction to Quantum Chemistry*. (CH 435) Spring 2021
- Designed and Taught *Thermodynamics and Kinetics*. (CH 433) Spring 2020
- Designed and Taught *Graduate Level Advanced Physical Chemistry*. (CH730) Fall 2018, 19, 20 & 21
- Mentored nine graduate students and two post-docs.

Professor and Mentor at Duke University **2012-2018**

- Contributed to the design of a magnetic resonance-based experiments for Phy 364L
- Produced video lectures teaching basics of NMR used in “flipped classroom” (of Chem 101DL).
- Contributed lectures to “General Chemistry” (Chem 210).
- Contributed lectures to “Quantum Chemistry” (Chem 541).
- Continuously mentored post-docs, graduate and undergraduate students.
- Mentored undergraduate students through the Duke Research Scholars Program.
- Held a graduate student seminar series at RWTH Aachen University: “Nuclear magnetic resonance down to zero field”.
- Participated in the Duke Chemistry Outreach Program: “Sharing Chemistry with the Community”.
- Guest-lectured in “Writing in the Sciences” at the University of North Carolina Chapel Hill (UNC).

Lecturer and Teaching Assistant at UC Berkeley **2007-2012**

- Co-Instructed 10 week *NMR Summer Courses in three consecutive years* for grad-students / post-docs.
- Taught upper division “*Analytical Chemistry lab*”.
- Taught lower division “*General Chemistry*” in two consecutive years.

Teaching Assistant and Elected Student Representative at University of Göttingen 2002-2006

- Introduced and administered department wide course evaluations.
- Introduced and organized annual departmental soccer tournament.
- Taught introductory *Quantum Mechanics*.
- Taught *General Chemistry* for students in medical school.

Public Talks

[53]	Invited Guest Lecture at the Quantum Technology Center at UMD	2021
[52]	Opening Session Invited talk at SMASH 2021	2021
[51]	Invited talk at the ISMAR-APNMR 2021	2021
[50]	Invited talk at the Global NMR Discussion Meetings	2021
[49]	Ampere Prize Award lecture at the EUROMAR 2020	2020
[48]	Invited talk at the Los Alamos National Lab: Physics/Theory Colloquium	2020
[47]	Invited opening talk of the 1 st ZULF conference	2020
[46]	Invited talk at the inaugural PERM 2020 virtual conference	2020
[45]	Invited talk at North Carolina State University, Department of Physics	2020
[44]	Invited talk at 12th ANZMAG 2019, Bunker Bay, Australia	2019
[43]	Invited talk at the University of Stuttgart, Institute of Smart Sensors, Germany	2019
[43]	Invited talk at the University of Tübingen, Werner Siemens Imaging Center	2019
[43]	Invited talk at the DTU (Danish Technical University), Copenhagen, Denmark	2019
[42]	Invited talk at the ISMRM annual meeting, Montreal, Canada	2019
[41]	Invited talk at the Southern Illinois University, Carbondale, IL	2019
[40]	Invited talk at the University of North Carolina at Greensboro, NC	2019
[39]	Invited talk at J. Gutenberg University of Mainz, Germany	2019
[38]	Invited talk at the University of Southampton, UK	2019
[37]	Invited talk at Wayne State University, Department of Chemistry	2018
[36]	Invited talk at The Fifth International Workshop on Metabolic Imaging at UPenn	2018
[35]	Invited talk at The Britton Chance Symposium on Metabolic Imaging and Spectroscopy	2018
[34]	Invited talk at Hyperpolarised Magnetic Resonance Conference HYP18	2018
[33]	Invited talk at University of Florida, Gainesville, UF	2018
[32]	Invited talk at Colorado State University,	2018
[31]	Invited talk at University of Oregon, Eugene, OR	2017
[30]	Invited talk at University of California, Davis	2017
[29]	Invited talk at NC State University, Raleigh, NC	2017
[28]	Invited Talk at Vanderbilt University, Institute of Imaging Science (VUIIS)	2017
[27]	Talk at the Spin Chemistry Meeting SCM2017	2017
[26]	Invited talk at the Chemistry Department of the University of William & Mary	2017
[25]	Talk at the International Society of Magnetic Resonance (ISMAR)	2017
[24]	Talk at the Experimental NMR Conference (ENC)	2017
[23]	Talk at the World Molecular Imaging Conference	2016
[22]	Invited talk at CCNY Dept. of Physics	2016

- [21] Invited talk at NYU Dept. of Chemistry **2016**
- [20] Invited Talk at UC Berkeley Dept. of Chemistry **2016**
- [19] Invited Talk at the The Fourth International Workshop on Hyperpolarized Carbon-13 and its Applications in Metabolic Imaging at UPenn **2016**
- [18] Wiley Lecture at the European magnetic resonance meeting (EUROMAR) **2015**
- [16] Invited talk at the ISMRM Study Group Session: Hyperpolarized Media and Hyperpolarization Methods & Equipment **2015**
- [15] Invited Talk at the “Mainz Magnetic Resonance Seminar” of the Max Planck Institute for Polymer Science, Mainz, Germany **2015**
- [14] Talk at the annual conference of the Center for Molecular and Biomolecular Imaging: **2015**
- [13] Invited Talk at the Wellcome Trust meeting, Advances in Clinical Diagnosis Utilising Parahydrogen: **2014**
- [12] Talk at the Duke Imaging Technology Fair **2014**
- [11] Talk at the: Relaxation and Hyperpolarisation Symposium: An EU COST Action **2014**
- [10] Talk at the annual conference of the Center for Molecular and Biomolecular Imaging: **2013**
- [9] Invited talk at RWTH Aachen University as Theodor-von Karman fellow: **2013**
- [8] Invited talk at the UNC, Physical Chemistry Seminar Series: **2013**
- [7] Talk at the 41st Southeastern Magnetic Resonance Conference: **2012**
- [6] Invited talk at Harvard University, Department of Physics: **2011**
- [5] Invited talk at Johns Hopkins University, Department of Radiology: **2011**
- [4] Talk in the Pines Lab Seminar Series at UC Berkeley **2010**
- [3] Talk at the Graduate Research Conference at UC Berkeley **2009**
- [2] Talk at the European Graduate School workshop, Clausthal University of Technology: **2006**
- [1] Talk at the 17th Annual Undergraduate Research Conference. Mills College Oakland, CA: **2005**

Peer Reviewed Publications [\(Google Scholar link here\)](#)

2021

- [58] “*Background-Free Proton NMR Spectroscopy with Radiofrequency Amplification by Stimulated Emission of Radiation*” B. Joalland, T. Theis, S. Appelt and E. Y. Chekmenev submitted to *just accepted as Very Important Paper (VIP) at Angew. Chem Int. Ed.* (2021)
- [57] “*Hyperpolarization of common antifungal agents with SABRE*” K. MacCulloch, P. M. TomHon, A. Browning, E. Akeroyd, S. Lehmkuhl, E. Y. Chekmenev and T. Theis* *Magn. Reson. Chem.* (2021) 1. <https://doi.org/10.1002/mrc.5187>
- [56] “*Density Functional Theory Study of Reaction Equilibria in Signal Amplification by Reversible Exchange*” K. Lin, P. TomHon, S. Lehmkuhl, R. Laasner, T. Theis,* and Volker Blum* *ChemPhysChem* (2021) **just accepted as Cover Article**
- [55] “*Intensified continuous extraction of switchable hydrophilicity solvents triggered by carbon dioxide*” S. Han, M. Ramezani, P. TomHon, K. Abdel-Latif, R. W. Epps, T. Theis and M. Abolhasani *Green Chem.* (2021), 23, 2900, Advance Article <https://doi.org/10.1039/D1GC00811K>”
- [54] “*Micron-Scale NV-NMR Spectroscopy with Signal Amplification by Reversible Exchange*” N. Arunkumar, D. B. Bucher, M. J. Turner, P. TomHon, D. Glenn, S. Lehmkuhl, M. D. Lukin, H. Park, M. S. Rosen*, T. Theis*, R. L. Walsworth* *PRX Quantum* (2021) 2, 010305 doi.org/10.1103/PRXQuantum.2.010305

- [53] “*SABRE and PHIP pumped RASER and the Route to Chaos*” S. Appelt, S. Lehmkuhl, S. Fleischer, B. Joalland, N. M. Ariyasingha, E. Y. Chekmenev and T. Theis **J. Magn. Reson.** (2021) 322, 106815 <https://doi.org/10.1016/j.jmr.2020.106815>

2020

- [52] “*SABRE polarized low field rare-spin spectroscopy*” S. Lehmkuhl, M. Siefert, A. Kentner, Y. Yen, B. Blümich, M. S. Rosen, S. Appelt and T. Theis **J. Chem. Phys.** 152, 184202 (2020); <https://doi.org/10.1063/5.0002412>
- [51] “*Rational ligand choice extends the SABRE substrate scope*” J. Colell, A. Logan, Z. Zhou, J. Lindale, Raul Laasner, R. Shchepin, E. Chekmenev, V. Blum, W. Warren, S. J. Malcolmson and T. Theis **Chem. Commun.** (2020) 56, 9336-9339 <https://doi.org/10.1039/D0CC01330G>
- [50] “*Parahydrogen-Induced Radio Amplification by Stimulated Emission of Radiation*” B. Joalland, N. M. Ariyasingha, S. Lehmkuhl, T. Theis, S. Appelt, E. Y. Chekmenev **Angew. Chem. Int. Ed.** (2020) 59, 22, 8654 DOI:10.1002/anie.201916597
- [49] “*Application of ¹⁵N₂-Diazirines as a Versatile Platform for Hyperpolarization of Biological Molecules by d-DNP*” H. Park, G. Zhang, J. Bae, T. Theis, W. Warren and Q. Wang. **Bioconjugate Chem.** (2020) 31, 3, 537 DOI: 10.1021/acs.bioconjchem.0c00028
- [48] “*Automated Pneumatic Shuttle for Magnetic Field Cycling and Parahydrogen Hyperpolarized Multidimensional NMR*” P. TomHon, E. Akeroyd, S. Lehmkuhl, E. Y. Chekmenev and T. Theis*, **J. Magn. Reson.** (2020) 312, 106700, DOI: 10.1016/j.jmr.2020.106700
- [47] “*Parahydrogen-induced Hyperpolarization of Gases*” K. V. Kovtunov, I. V. Koptyug M. Fekete S. B. Duckett, T. Theis, B. Joalland, E. Y. Chekmenev **Angew. Chem. Int. Ed.** (2020) 59, 41, 17788 DOI: <https://doi.org/10.1002/anie.201915306>
- [46] “*Parawasserstoff-induzierte Hyperpolarisation von Gasen*” K. V. Kovtunov, I. V. Koptyug M. Fekete S. B. Duckett, T. Theis, B. Joalland, E. Y. Chekmenev **Angew. Chem.** (2020) 132, 2-12 DOI: <https://doi.org/10.1002/ange.201915306>

2019

- [45] “*Iodonitrene in Action: Direct Transformation of Amino Acids into Terminal Diazirines and ¹⁵N₂ - Diazirines and their Application as Hyperpolarized Markers*” T. Glachet, H. Marzag, N. S. Rosa, J. F. P. Colell, G. Zhang, W. Warren, X. Franck, T. Theis*, V. Reboul* **J. Am. Chem. Soc.** (2019) 141, 34, 13689-13696 <https://doi.org/10.1021/jacs.9b07035>
- [44] “*Selective hyperpolarization of heteronuclear singlet states via pulsed microtesla SABRE*” C. P. N. Tanner, J. R. Lindale, S. L. Eriksson, Z. Zhou, J.F.P. Colell, T. Theis, W. Warren **J. Chem. Phys.** (2019) 151 (4), 044201, <https://doi.org/10.1063/1.5108644>
- [43] “*Quasi-Resonance Fluorine-19 Signal Amplification By Reversible Exchange*” N. M. Ariyasingha, J. R. Lindale, S. L. Eriksson, G. P. Clark, T. Theis, R. V. Shchepin, N. Chukanov, K. V. Kovtunov, I. V. Koptyug, W. S. Warren, E. Y. Chekmenev. **Chem. Phys. Lett.** (2019) 10, 15, 4229, <https://doi.org/10.1021/acs.jpcclett.9b01505>

- [42] “Terminal Diazirines Enable Reverse Polarization Transfer from $^{15}\text{N}_2$ Singlets” G. Zhang, J. F.P. Colell, T. Glachet, J. R. Lindale, V. Reboul*, T. Theis*, W. Warren* *Angew. Chem. Int. Ed.* (2019) 58, 32, 11118 DOI: <https://doi.org/10.1002/anie.201904026>
- [41] “Nuclear Magnetic Resonance Spectroscopy | Hyperpolarization for Sensitivity Enhancement” B. M. Goodson, B. Kidd, J. B. Hövener, L. Schröder, T. Theis, N. Whiting, E. Y. Chekmenev, *Encyclopedia of Analytical Science* (3rd Ed.) ELSEVIER DOI: <https://doi.org/10.1016/B978-0-12-409547-2.14072-7>
- [40] “Hyperpolarizing Concentrated Metronidazole $^{15}\text{NO}_2$ Group Over Six Chemical Bonds with More Than 15% Polarization and 20 Minute Lifetime”, R. V. Shchepin, J. R. Birchall, N. V. Chukanov, K. V. Kovtunov, I. V. Koptuyug, T. Theis, W. S. Warren, J. G. Gelovani, B. M. Goodson, S. Shokouhi, M. S. Rosen, Y. Yen, W. Pham, E. Y. Chekmenev *Chem. Eur. J.* (2019) 25 (37), 8829 DOI: <https://doi.org/10.1002/chem.201901192>
- [39] „Unveiling coherently driven hyperpolarization dynamics in signal amplification by reversible exchange“ J. Lindale, S. Eriksson, C. Tanner, Z. Zhou, J. Colell, G. Zhang, J. Bae, E. Chekmenev, T. Theis and W. Warren *Nat. Commun.* (2019) 10 (1), 395 DOI: 10.1038/s41467-019-08298-8

2018

- [38] “Quasi-Resonance Signal Amplification by Reversible Exchange” T. Theis, N. M. Ariyasingha, R. V. Shchepin, J. R. Lindale, W. S. Warren and E. Y. Chekmenev *J. Phys. Chem. Lett.* (2018), 9 (20), 6136–6142 DOI: 10.1021/acs.jpcllett.8b02669
- [37] “ $^{15}\text{N}_4$ -1,2,4,5-tetrazines as potential molecular tags: Integrating bioorthogonal chemistry with hyperpolarization and unearthing para- N_2 ” J. Bae, Z. Zhou, T. Theis*, W. Warren and Qiu Wang* *Science Advances* (2018) 4, 3, eaar2978, DOI: 10.1126/sciadv.aar2978 *corresponding author
- [36] “Parahydrogen-based Hyperpolarization for Biomedicine” J. Hovener, A. N. Pravdivtsev, B. Kidd, C. R. Bowers, S. Glöggler, K. V. Kovtunov, M. Plaumann, R. Katz-Brull, K. Buckenmaier, A. Jerschow, F. Reineri, T. Theis, R. V Shchepin, S. Wagner, N. Zacharias, P. Bhattacharya, E. Y. Chekmenev *Angew. Chem. Int. Ed.* (2018) 57, 11140, DOI: 10.1002/anie.201711842
- [35] “Parawasserstoff-basierte Hyperpolarisierung für die Biomedizin” J. Hovener, A. N. Pravdivtsev, B. Kidd, C. R. Bowers, S. Glöggler, K. V. Kovtunov, M. Plaumann, R. Katz-Brull, K. Buckenmaier, A. Jerschow, F. Reineri, T. Theis, R. V Shchepin, S. Wagner, N. Zacharias, P. Bhattacharya, E. Y. Chekmenev *Angew. Chem.* (2018) 130, 11310, DOI:1002/ange.201711842

2017

- [34] “Diazirines as Potential Molecular Imaging Tags: Probing the Requirements for Efficient and Long-Lived SABRE-Induced Hyperpolarization” K. Shen, A. W. J. Logan, J. F. P. Colell, J. Bae, G. X. Ortiz Jr., T. Theis, W. S. Warren, S. J. Malcolmson, Q. Wang *VIP, COVER ARTICLE: Angew. Chem. Int. Ed.* (2017) 56, 40, 12112 DOI: 10.1002/anie.201704970.

- [33] "Instrumentation for nuclear magnetic resonance in zero and ultralow magnetic field" M. C. D. Tayler, T. Theis, T. F. Sjolander, J. W. Blanchard, A. Kentner, S. Pustelny, A. Pines and D. Budker Invited Contribution, **COVER ARTICLE *Rev. Sci. Inst.*** (2017) 88, 091101 DOI: 10.1063/1.5003347
- [32] "Long-Lived $^{13}\text{C}_2$ Nuclear Spin States Hyperpolarized by Parahydrogen in Reversible Exchange at Micro-Tesla Fields" Z. Zhou, J. Yu, J. F. P. Colell, R. Laasner, A. W. J. Logan, D. A. Barskiy, R. V. Shchepin, E. Y. Chekmenev, V. Blum, W. S. Warren, and T. Theis* ***J. Phys. Chem. Lett.***, (2017) 8, 3008; DOI: 10.1021/acs.jpcclett.7b00987.
*corresponding author
- [31] "Toward Hyperpolarized ^{19}F Molecular Imaging via Reversible Exchange with Parahydrogen" R. V. Shchepin, B. M. Goodson, T. Theis, W. S. Warren, E. Y. Chekmenev
"Toward Hyperpolarized ^{19}F Molecular Imaging via Reversible Exchange with Parahydrogen"
COVER ARTICLE *ChemPhysChem* (2017) 18, 15, 1961 DOI: 10.1002/cphc.201700594.
- [30] "The Absence of Quadrupolar Nuclei Facilitates Efficient ^{13}C Hyperpolarization via Reversible Exchange with Parahydrogen" D. A. Barskiy, R. V. Shchepin, C. P. N. Tanner, J. F. P. Colell, B. M. Goodson, T. Theis, W. S. Warren, and E. Y. Chekmenev ***ChemPhysChem*** (2017) 18, 1493; DOI: 10.1002/cphc.201700416.
- [29] "Hyperpolarization of Nitrogen-15 in Aqueous Media with Parahydrogen in Reversible Exchange" J. F. P. Colell, M. Emondts, A. W. J. Logan, K. Shen, J. Bae, R. Shchepin, G. X. Ortiz, P. Spanning, Q. Wang, S. J. Malcolmson, E. Y. Chekmenev, M. Feiters, F. Rutjes, B. Blümich,* T. Theis* and W. S. Warren. ***J. Am. Chem. Soc.*** (2017) 139 (23), 7761; DOI: 10.1021/jacs.7b00569.
- [28] "Generalizing, Extending, and Maximizing Nitrogen-15 Hyperpolarization Induced by Parahydrogen in Reversible Exchange" J. F. P. Colell, A. W. J. Logan, Z. Zhou, R. V. Shchepin, D. A. Barskiy, G. X. Ortiz, Q. Wang, S. J. Malcolmson, E. Y. Chekmenev, W. S. Warren, and T. Theis* **COVER *J. Phys. Chem. C*** (2017) 121 (12), 6626 DOI: 10.1021/acs.jpcc.6b12097.

2016

- [27] " ^{15}N Hyperpolarization of Imidazole- $^{15}\text{N}_2$ for Magnetic Resonance pH Sensing Via SABRE-SHEATH" R. V. Shchepin, D. A. Barskiy, A. M. Coffey, T. Theis, F. Shi, W. S. Warren, B. M. Goodson, E. Y. Chekmenev ***ACS Sens.*** (2016) 1, 6, 640 DOI: 10.1021/acssensors.6b0023.
- [26] "Hyperpolarization of Nitrogen-15 Schiff Bases by Reversible Exchange Catalysis with para-Hydrogen" A.W.J. Logan, T. Theis*, J.F.P. Colell, W.S. Warren, S.J. Malcolmson ***Chem. Eur. J.*** (2016) 22 (31) 10777.
- [25] "Over 20% ^{15}N Hyperpolarization in Under One Minute for Metronidazole, an Antibiotic and Hypoxia Probe" D. A. Barskiy, R.V. Shchepin, A.M. Coffey, T. Theis, W. S. Warren, B. M. Goodson and E. Y. Chekmenev, ***J. Am. Chem. Soc.*** (2016) 138 (26), 8080.
- [24] "Accessing long lived ^1H states via ^2H couplings" Z. Zhou, K. Claytor, W. S. Warren, T. Theis* ***J. Magn. Reson.*** (2016), 263, 108–115.
- [23] "Direct and Cost-efficient Hyperpolarization of Long-lived Nuclear Spin States on Universal Molecular Tags" T. Theis*, G. Ortiz, A. W. Logan, K. Claytor, Y. Feng, W. Huhn, V. Blum, S. Malcolmson, E. Chekmenev, Q. Wang, W. Warren, ***Sci. Adv.*** (2016), 2, (3), e1501438.
Top Story in NSF Science 360 News and Highlight in the Boston Globe

2015

- [22] "Hyperpolarization of "Neat" Liquids by NMR Signal Amplification by Reversible Exchange" R. Shchepin, M. Truong, T. Theis, A. Coffey, F. Shi, K. Waddell, W. Warren, B. Goodson, and E. Chekmenev, *Phys. Chem. Lett.* (2015), 6 (10), 1961–1967.
- [21] "¹⁵N Hyperpolarization by Reversible Exchange Using SABRE-SHEATH" M. L. Truong, T. Theis, A. M. Coffey, R. V. Shchepin, K. W. Waddell, F. Shi, B. M. Goodson, W. S. Warren, and E. Y. Chekmenev *J. Phys. Chem. C* (2015) 119 (16), 8786–8797.
- [20] "Microtesla SABRE Enables 10% Nitrogen-15 Nuclear Spin Polarization" T. Theis, M. L. Truong, A. M. Coffey, K. W. Waddell, F. Shi, B. M. Goodson, W. S. Warren and E. Y. Chekmenev *J. Am. Chem. Soc.* (2015) 137(4), 1404.

2014

- [19] "Accessing long-lived disconnected spin-1/2 eigenstates through spins > 1/2" K. Claytor, T. Theis, Y. Feng, J. Yu, D. Gooden, W. S. Warren *J. Am. Chem. Soc.* (2014) 136(43), 15118.
- [18] "LIGHT-SABRE enables efficient in-magnet catalytic hyperpolarization" T. Theis, M. Truong, A. Coffey, E. Chekmenev, W. Warren *J. Magn. Reson. COVER ARTICLE* (2014), 248, 23-26
- [17] "Long Lived Polarization Protected by Symmetry: LOLIPOPS" Y. Feng, T. Theis, T. Wu, K. Claytor, W. S. Warren *J. Chem. Phys.* (2014) 141, 134307.
- [16] "Analysis of parahydrogen polarized spin systems in low magnetic fields" P. Tuersmann, J. Colell, T. Theis, B. Blümich, S. Appelt; *Phys. Chem. Chem. Phys.* (2014) 16, 15411.
- [15] "Long-lived heteronuclear spin singlet states in liquids at zero-field" M. Emondts, M. P. Ledbetter, S. Pustelny, T. Theis, B. Patton, J. W. Blanchard, M. C. Butler, D. Budker, A. Pines; *Phys. Rev. Lett.* (2014), 112, 077601.
Spotlight on Exceptional Research by the APS: "Vive la Difference!" *Physics* 7, 17 (2014).
- [14] "Measuring Long-Lived ¹³C-Singlet State Lifetimes at Natural Abundance" K. E. Claytor, T. Theis, Y. Feng and W.S. Warren. *J. Magn. Reson.* (2014), 239, 81-86.
- [13] "Composite and shaped pulses for efficient and robust pumping of dark states in magnetic resonance" T. Theis, Y. Feng, T. Wu and W. Warren *J. Chem. Phys.* (2014) 140, 014201. doi: 10.1063/1.4851337.

2013

- [12] "Storage of hydrogen spin polarization in long-lived ¹³C₂-singlet order and implications for hyperpolarized magnetic resonance imaging" Y. Feng*, T. Theis*, X. Liang, Q. Wang, P. Zhou, W. S. Warren *J. Am. Chem. Soc.* (2013), 135(26), 9632. *Equal contribution
- [11] "Chemical analysis using J-coupling multiplets in zero-field NMR". T. Theis, J. W. Blanchard, M.C. Butler, D. Budker, A. Pines; *Chem. Phys. Lett.* (2013), 580, 160.
- [10] "Fundamental aspects of parahydrogen enhanced low field nuclear magnetic resonance" J. Colell, P. Türschmann, S. Glöggler, P. Schleker, T. Theis, M. Ledbetter, D. Budker, A. Pines, B. Blümich, and S. Appelt; *Phys. Rev. Lett.* (2013), 110(13), 137602.

- [9] “*Multiplets at zero magnetic field: the geometry of zero-field NMR*”
M. C. Butler, M. P. Ledbetter, T. Theis, J. W. Blanchard, D. Budker, A. Pines;
J. Chem. Phys. (2013), *138*, 184202.
- [8] “*Parahydrogen-induced polarization at zero magnetic field*”
M. Butler, G. Kervern, T. Theis, M. Ledbetter, P. Ganssle, J. Blanchard, D. Budker, A. Pines;
J. Chem. Phys. (2013), *138*, 234201.
- [7] “*High-Resolution Zero-Field NMR J-Spectroscopy of Aromatic Compounds*”
J. W. Blanchard, M. P. Ledbetter, T. Theis, M. C. Butler, Dmitry Budker, A. Pines;
J. Am. Chem. Soc. (2013), *135*(9), 3607.

2012

- [6] “*Vibrationally resolved transition state spectroscopy of the F+H₂ and F+CH₄ reactions*”
T. I. Yacovitch, E. Garand, J. B. Kim, C. Hock, T. Theis, D. M. Neumark;
Faraday Discuss. (2012), *157*, 399–414.
- [5] “*Zero-Field NMR Enhanced by Parahydrogen in Reversible Exchange*”
T. Theis, J.W. Blanchard, P. Ganssle, H.D. Shin, G. Kervern, M.C. Butler, M. P. Ledbetter, D. Budker and A. Pines; *J. Am. Chem. Soc.* (2012), *134*, 3987–3990.

2011

- [4] “*Near-zero field magnetic resonance*”
M. Ledbetter, T. Theis, J. Blanchard, H. Ring, S. Appelt, B. Blümich, A. Pines, and D. Budker;
Phys. Rev. Lett. (2011), *107*, 107601.
Highlighted in a **Spotlight on Exceptional Research by the APS**:
“Magnetic scans with a tiny magnet”.
- [3] “*Parahydrogen-enhanced zero-field nuclear magnetic resonance*”
T. Theis, P. Ganssle, G. Kervern, S. Knappe, J. Kitching, M. P. Ledbetter, D. Budker and A. Pines;
Nat. Phys. (2011), *7*, 571–575.
Highlighted in **Nature**, **Nature Physics**, and online in **Physics World** and at **LBNL News Center**.

Publications from undergraduate work

- [2] “*PLP labeling in ESR spectroscopic analysis of secondary and tertiary acrylate propagating radicals.*”
M. Buback, P. Hesse, T. Junkers, T. Sergeeva, T. Theis*; *Macromolecules* (2008), *41*(2), 288
- [1] “*Chain-length-dependant termination in acrylate radical polymerization studied via pulsed-laser-initiated RAFT polymerization.*”
M. Buback, P. Hesse, T. Junkers, T. Theis*, P. Vana; *Aust. J. Chem.* (2007), *60*(10), 779-787.

Patents

- “*Method for creating hyperpolarization at microtesla magnetic fields*” (US20160169998 A1, **2016**)
- *Parahydrogen Hyperpolarization Membrane Reactor: ATTORNEY DOCKET NO. 221404-8920, filed with the USPTO on April 7 2020.*
- “*Temperature Cycling Method for Hyperpolarization of Target Molecules and Contrast Agents Using Parahydrogen*” Provisional filed with the USPTO on July 27th 2021

Additional Information

See:

theislab.wordpress.ncsu.edu

[orcid: 0000-0001-6779-9978](https://orcid.org/0000-0001-6779-9978)

[Google Scholar link here](#)
