Scott R. Burt, Ph.D.

CONTACT INFORMATION

Brigham Young University
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PROFESSIONAL APPOINTMENTS

Brigham Young University, Provo, Utah

Professor, Dpt. of Chemistry and Biochemistry, 2019–current
Associate Professor, Dpt. of Chemistry and Biochemistry, 2014–2019
Assistant Professor, Dpt. of Chemistry and Biochemistry, 2008–2014

- NMR facility manager
- He recovery system manager
- Teach general chemistry and NMR courses

EDUCATION

University of California, Berkeley, California

Ph.D. Physical Chemistry, 2004–2008

- Advisor: Professor Alex Pines
- Dissertation: "MRI of Heterogeneous Hydrogenation Reactions Using Parahydrogen Polarization"

Brigham Young University, Provo, Utah

B.S. Chemistry, *Cum Laude*, 1998–1999, 2001–2004

- Advisor: Professor Randy Shirts
- Area of Study: Statistical Mechanics
- Minors: Mathematics, Scandinavian Studies

AFFILIATIONS & SERVICE

NSF MRI Review Panel
- 2023, 2024

Association of Managers in Magnetic Resonance Laboratories
- Steering Committee, 2022–current

American Chemical Society
- Central Utah Local Section Chair-outgoing, 2020–2021
- Central Utah Local Section Chair, 2018–2019
- Central Utah Local Section Chair-elect, 2016–2017
- Faculty advisor for our local student ACS section (Y-chem), 2012–2015

ACADEMIC AWARDS

Faculty

- Utah Award—Chemistry Professional, Combined Central Utah and Salt Lake Local ACS Sections, 2021
- Karl G. Maeser Professional Faculty Excellence Award, Brigham Young University, 2020

Graduate

- Department of Homeland Security Graduate Research Fellowship, 2005–2008
- Eric Abramson Memorial Fellowship, 2005

Undergraduate

- National Merit Scholarship, 1998–2004
- 2 Office of Research and Creative Activities Research Grants, 2002–2004
- 5 Chemistry Department Research Awards, 2002–2004
- 3 Summer-term Academic Scholarships, 2002–2004

Research Experience

University of California, Berkeley

Graduate Research Assistant Fall 2004–2008

Dr. Alex Pines, Department of Physical Chemistry

- Nuclear Magnetic Resonance: parahydrogen induced polarization (PHIP).
- Designed and built experimental setup to produce 25%, 50% or 99.7% parahydrogen for use in continuous flow, stopped flow and high pressure applications.
- Demonstrated, for the first time, parahydrogen polarization of gases.
- Studied a variety of systems using my parahydrogen setup:
  - Novel supported catalysts, allowing heterogeneous phase PHIP.
  - Void space MRI using gas phase PHIP.
  - Micro-reactor imaging and flow imaging using gas phase PHIP.
- Used Mathematica and Matlab for data processing and to study the polarized state and its evolution.
- Maintanence of the lab magnets: cryogen fills, coordinated repairs and upgrades.
- Training in and extensive use of the student machine shop.

Lawrence Livermore National Laboratory

DHS Summer Research Intern Summer 2006

Tom Slezak, Bioinformatics Knowledge Center

- Bioinformatics: Assisted in the development of a forensic analysis chip for Foot and Mouth Disease Virus (FMDV).
- Python and PERL programming: Designed and created several programs to automate data mining tasks, including locating conserved and unique regions of the FMDV genome.

Brigham Young University

Undergraduate Research Assistant 2002–2004

Dr. Randy Shirts, Department of Chemistry and Biochemistry

- Statistical Mechanics: Finite size corrections for isolated systems.
- C++ programming: Designed and created software to simulate a micro-canonical, hard-sphere gas in 1, 2 and 3 dimensions with various boundary conditions to test our analytical results.
- Java programming: Created the physics kernel and helped design Boltzmann 3D, an educational program to demonstrate simple molecular kinetics.

Teaching Experience

Introductory General Chemistry (Chem 101)

Course content: Atomic and molecular structure, periodic relationships, states of matter, chemical reactions and stoichiometry, acids and bases.

General College Chemistry (Chem 105)

Course content: Atomic and molecular structure, bonding, periodic properties of the elements, reaction energetics, electrochemistry, acids and bases, inorganic and organic chemistry.

General College Chemistry (Chem 106)

Course content: Chemical kinetics and equilibrium, acid-base equilibrium, chemical thermodynamics, electrochemistry, nuclear chemistry, inorganic and organic chemistry.

Synthesis and Qualitative Organic Analysis (Chem 455)

Course content: theory of FT-NMR in one and two dimensions, the interpretation of 1D and 2D NMR spectra, strategies for structural analysis. Trained students to use the NMR Facility and supervised their activities during lab hours. Training topics: magnet safety, sample preparation, optimizing parameters based on concentration, 1D protocols (^{1}H, ^{13}C, ^{19}F, ^{31}P, DEPT, 1D-TOCSY, 1D-NOESY), 2D protocols (COSY, TOCSY, HSQC, HSQC-TOXY, HMBC, NOESY).

Organic Spectroscopic Identification (Chem 555)

Course content: theory of FT-NMR in one and two dimensions, the interpretation of 1D and 2D NMR spectra, strategies for structural analysis. Trained students to use the NMR Facility and supervised their activities during lab hours. Training topics: magnet safety, sample preparation, optimizing parameters based on concentration, 1D protocols (^{1}H, ^{13}C, ^{19}F, ^{31}P, DEPT, 1D-TOCSY, 1D-NOESY), 2D protocols (COSY, TOCSY, HSQC, HSQC-TOXY, HMBC, NOESY).

Advanced Techniques in Nuclear Magnetic Resonance (Chem 655, 596R)

Course content depends on student interest and background. Common topics include the quantum origins of the NMR signal, understanding pulse sequences using the density matrix and product operators, the theory of 2D NMR, the quantum theory of nuclear spin relaxation, heteronuclear NMR, basic approach for structure determination of biomolecules, software tools for analyzing multiple 2D and 1D spectra in concert for structure elucidation, and a review of the important 2D NMR experiments (COSY, HSQC, HMBC, TOCSY, NOESY and variations).

Scientific Writing and Ethics (Chem 694)

Course content: Technical writing (sentence and paragraph structure, grammar and rhetoric, cohesion and coherence, emphasis, concision, shape) and ethics (treatment of data, mistakes and negligence, plagiarism, research misconduct, allocating credit, intellectual property, patents and copyright, conflicts of interest, pathological science).

NMR in Biochemistry, Guest Lectures (Chem 489, 581)

Topics: NMR parameters and their relation to biomolecules, multi-dimensional NMR, practical aspects of protein NMR, spectral assignment strategies, conformational constraints, and generating a family of structures.

Old Norse Language and Literature (Scand 429, Iclnd 429)

This course is an introduction to the language and literature of medieval Scandinavia (primarily, medieval Iceland and Norway). The first half of the course focuses on the grammar and vocabulary of Old Norse using examples from a variety of Old Norse texts. The second half of the course emphasizes reading longer passages in Old Norse. In addition to providing the students with a working knowledge of Old Norse and exposure to the literature, we also discuss the historical context of the various types of Old Norse literatures within Medieval Scandinavia and Europe.

Major texts translated by the students include excerpts from the *Prose Edda*; excerpts from *Hrolfs Saga, Kraki*; *Audun's Tale*; *The Tale of Thorsteinn Staff-Struck*; most of *Hrafnkel's Saga*; excerpts from *Njals Saga*; and a variety of shorter excerpts from the *Family Sagas*.

To give the students an appreciation of the scope of the longer sagas, they read *Njals Saga* in its entirety in English.

PUBLICATIONS

Faculty research at Brigham Young University:

1. Rodriguez Moreno, M.; Johnson, N.C.; Stewart, C.B.; Setelin, M.L.; Wayment, A.X.; Felix, B.M.; **Burt, S.R.**; Michaelis, D.J. Solid-Phase Peptide Synthesis and 2D NMR **Analysis of Unknown Tripeptides - an Advanced Undergraduate Synthesis and Spectroscopy Laboratory.** *Journal of Chemical Education*, **101** (5), 2024, 2059-2064. DOI: 10.1021/acs.jchemed.3c01188

2. Iorkula, T.H.; Tolman, B.A.; **Burt, S.R.**; Peterson, M.A. **An Efficient Synthesis of C-6 Aminated 3-bromoimidazo[1,2-b]pyridazines.** *Synthetic Communications*, **54** (2), 2024, 121-132. DOI: 10.1080/00397911.2023.2284350

3. Parkman, J.A.; Barlow, C.D.; Sheppert, A.P.; Jacobsen, S.; Barksdale, C.A.; Wayment, A.X.; Newton, M.P.; **Burt, S.R.**; Michaelis, D.J. **Structural Analysis of Non-native Peptide-Based Catalysts Using 2D NMR-Guided MD Simulations.** *Journal of Physical Chemistry A*, **127** (26), 2023, 5602-5608. DOI: 10.1021/acs.jpca.3c03389

4. **Burt, S.R.**; Harper, J.K.; Cool, L.G. **A New Depsidone from the Neotricone-rich Chemotype of the Lichenised Fungus Usnea Fulvoreagens.** *Natural Product Research*, **37** (13), 2023, 2248-2254. DOI: 10.1080/14786419.2022.2038594

5. Peterson, J.W.; **Burt, S.R.**; Yuan, Y.; Harper, J.K. **Rapid, Quantitative Nuclear Magnetic Resonance Test for Oxygen-17 Enrichment in Water.** *Analytical Chemistry*, **94** (15), 2022, 5741-5743. DOI: 10.1021/acs.analchem.2c00081

6. Wayment, A.X.; Rodriguez Moreno, M.; Jones, C.J.; Smith, G.J.; Jarman, P.; Garcia Morin, N.J.; Coombs, M.J.; Parkman, J.A.; Barlow, C.D.; Smith, S.A.; **Burt, S.R.**; Michaelis, D.J. **Optimizing the Local Chemical Environment on a Bifunctional Helical Peptide Scaffold Enables Enhanced Enantioselectivity and Cooperative Catalysis.** *Organic Letters*, **24** (16), 2022, 2983-2988. DOI: 10.1021/acs.orglett.2c00857

7. Machicao, P.A.; **Burt, S.R.**; Christensen, R.K.; Lohner, N.B.; Singleton, J.D.; Peterson, M.A. **An Efficient Microwave Assisted Synthesis of N'-Aryl/(alkyl)-substituted N-(4-hydroxy-6-phenylpyrimidin-2-yl)guanidines: Scope and Limitations.** *Tetrahedron Letters*, **58**, 2017, 2318-2321. DOI: 10.1016/j.tetlet.2017.03.063

8. Cryer, M.; Lane, K.; Cates, R.; **Burt, S.R.**; Andrus, M.; Zou, J.; Rogers, P.; Hansen, M.; Panayampalli, S.; Burgado, J.; Day, C.; Smee, D.; Allen, R.; Johnson, F.B. **Isolation and Identification of Compounds from Kalanchoe Pinnata Having HSV-2 and Vaccinia Antivirus Activity.** *Pharm. Biol.*, **55**, 2017, 1586-1591. DOI: 10.1080/13880209.2017.1310907

9. Son, D.J.; Kim, D.H.; Nah, S.; Park, M.H.; Lee, H.; Han, S.; Venkatareddy, U.; Gann, B.; Rodriguez, K.; **Burt, S.R.**; Ham, Y.W.; Jung, Y.Y.; Hong, J.T. **Novel Synthetic (E)-2-methoxy-4-(3-(4-methoxyphenyl)prop-1-en-1-yl)phenol Inhibits Arthritis by Targeting Signal Transducer and Activator of Transcription 3.** *Scientific Reports*, **6**, 2016, 36852. DOI: 10.1038/srep36852

10. Paudyal, M.P.; Adebesin, A.M.; **Burt, S.R.**; Ess, D.H.; Ma, Z.; Kürti, L.; Falck, J.R. **Dirhodium-Catalyzed C-H Arene Amination Using Hydroxylamines.** *Science*, **353**, 8 Sep. 2016, 1144-1147. DOI: 10.1126/science.aaf8713

11. Udumula, V.; Nazari, S.H.; **Burt, S.R.**; Alfindee, M.N.; Michaelis, D.J. **Chemo- and Site-Selective Alkyl and Aryl Azide Reductions with Heterogeneous Nanoparticle Catalysts.** *ACS Catalysis*, **6**, 2016, 4423-4427. DOI: 10.1021/acscatal.6b01217

12. Bennallack, P.R.; **Burt, S.R.**; Heder, M.J.; Robison, R.A.; Griffitts, J.S. **Characterization of a Novel Plasmid-Borne Thiopeptide Gene Cluster in *Staphylococcus epidermidis* Strain 115.** *Journal of Bacteriology*, **196**, 2014, 4344-4350. DOI: 10.1128/jb.02243-14

13. Jarenwattananon, N.N.; Glöggler, S.; Otto, T.; Melkonian, A.; Morris, W.; **Burt, S.R.**; Yaghi, O.M.; Bouchard, L.-S. **Thermal Maps of Gases in Heterogeneous Reactions.** *Nature*, **502**, 2013, 537-540. DOI: 10.1038/nature12568

14. Khosravi, M.; Andrus, M.B.; **Burt, S.R.**; Woodfield, B.F. **Generalized Preparation Method and Characterization of Aluminum Isopropoxide, Aluminum Phenoxide, and Aluminum *n*-Hexyloxide.** *Polyhedron*, **62**, 2013, 18-25. DOI: 10.1016/j.poly.2013.06.019

15. Curtis, A.D.; **Burt, S.R.**; Calchera, A.; Patterson, J.E. **Limitations in the Analysis of Vibrational Sum-Frequency Spectra Arising from the Nonresonant Contribution.** *Journal of Physical Chemistry C*, **115**, 2011, 11550-11559. DOI: 10.1021/jp200915z

16. Shelton, J.R.; **Burt, S.R.**; Peterson, M.A. **A Broad Spectrum Anticancer Nucleoside with Selective Toxicity Against Human Colon Cells In Vitro.** *Bioorganic & Medicinal Chemistry Letters*, **21**, 2011, 1484-1487. DOI: 10.1016/j.bmcl.2011.01.003

Graduate research at U.C. Berkeley:

17. Bouchard, L.-S.; **Burt, S.R.**; Anwar, M.S.; Kovtunov, K.V.; Koptyug, I.V.; Pines, A. **NMR Imaging of Catalytic Hydrogenation in Microreactors with the Use of para–Hydrogen.** *Science*, **319**, 25 January 2008, 442-445. DOI: 10.1126/science.1151787

18. Bouchard, L.-S.; Kovtunov, K.V.; **Burt, S.R.**; M. Anwar, M.S.; Koptyug, I.V.; Sagdeev, R.Z.; Pines, A. **Parahydrogen-Enhanced Hyperpolarized Gas-Phase Magnetic Resonance Imaging.** *Angewandte Chemie International Edition*, **46** (22), 25 May 2007, 4064-4068. DOI: 10.1002/anie.200700830

19. Koptyug, I.V.; Kovtunov, K.V.; **Burt, S.R.**; Anwar, M.S.; Hilty, C.; Han, S.-I.; Pines, A.; Sagdeev, R.Z. **Parahydrogen-Induced Polarization in Heterogeneous Hydrogenation Reactions.** *Journal of American Chemical Society*, **129** (17), 2007, 5580-5586. DOI: 10.1021/ja068653o

Undergraduate research at Brigham Young University:

20. Shirts, R.B.; **Burt, S.R.**; Johnson, A.M. **Periodic Boundary Condition Induced Breakdown of the Equipartition Principle and Other Kinetic Effects of Finite Sample Size in Classical Hard-Sphere Molecular Dynamics Simulation.** *Journal of Chemical Physics*, **125** (16): 28 Oct 2006, 164102. DOI: 10.1063/1.2359432