

**Daniel E. Austin, Ph.D.**

Professor, Department of Chemistry and Biochemistry  
Director, Instrumental Analysis Laboratory  
Brigham Young University  
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**Education**

California Institute of Technology, Pasadena, CA  
Ph.D. in Physical Chemistry, 2003  
Dissertation: "Impact Ionization Mass Spectrometry of Cosmic Dust"  
Advisor: J. L. (Jack) Beauchamp

Brigham Young University, Provo, UT  
B.S. in Chemistry, 1998

**Professional Experience**

Brigham Young University, Provo, UT  
Miniaturized mass spectrometers for portable analysis and planetary missions  
Chemical and biological processes in ultra-high-velocity impacts  
Charge detection mass spectrometry  
Principal Investigator of over \$7M of research funding

Goddard Space Flight Center, Greenbelt, MD  
Mars Organic Molecule Analyzer (MOMA) for the ESA ExoMars rover

Sandia National Laboratories, Albuquerque, NM  
Ion mobility spectrometer/mass spectrometer for explosive and contraband detection  
Microfabricated cylindrical ion trap mass analyzers

**Awards and Honors**

Curt Brunnée Award, International Mass Spectrometry Foundation, 2018  
Karl G. Maeser Research and Creative Arts Award, Brigham Young University, 2017  
American Society for Mass Spectrometry Research Award, 2008  
Pittsburgh Spectroscopy Society Starter Grant Award, 2007  
Achievement Rewards for College Scientists (ARCS) Fellowship, 2000–2002  
National Science Foundation Graduate Research Fellowship, 1998–2001  
Dow Chemical Company Graduate Fellowship, 2001  
Fannie and John Hertz Foundation Graduate Fellowship, finalist, 1998  
Barry M. Goldwater Scholarship, 1997–1998

## Professional Service and Leadership

### American Society for Mass Spectrometry (ASMS)

Member of the ASMS program committee (2011, 2012)  
Co-chair (2014) and Chair (2015–2016) of the Ion Trap Interest Group  
Co-chair (2009–2010) and Chair (2010–2011) of the Fundamentals Interest Group  
Member of the ASMS Research Awards committee (2 yrs)  
Organizer and Chair of the 2016 Asilomar Conference on Mass Spectrometry

### American Chemical Society (ACS)

Chair-Elect (2012–2013), Chair (2014–2015), Past-Chair (2016), Central Utah Section  
Faculty Advisor for BYU ACS student chapter (2008–2012)  
Commendable Chapter Award (2009–2012)

Editorial Board member, *International Journal of Mass Spectrometry*, 2017–present

Organized/presided at conference sessions for:

American Society for Mass Spectrometry annual conference (2011, 2012, 2015, 2016)  
Pittsburgh Conference on Analytical Chemistry (2010, 2011, 2015, 2016)  
Federation of Analytical Chemistry and Applied Spectroscopy Societies (2011)  
Arrowhead Conference on Ion Chemistry and Mass Spectrometry (2007, 2008, 2011)  
American Chemical Society Rocky Mountain Regional Meeting (2008)  
Asilomar Conference on Mass Spectrometry (2008, 2016)

Reviewed manuscripts for the following journals:

*Journal of the American Chemical Society, Analytical Chemistry, Journal of the American Society for Mass Spectrometry, Journal of Mass Spectrometry, Analyst, International Journal of Mass Spectrometry, Mass Spectrometry Reviews, Journal of Geophysical Research – Planets, Planetary and Space Science, Earth and Planetary Science Letters, Journal of Microelectromechanical Systems (JMEMS), TrAC—Trends in Analytical Chemistry, Rapid Communications in Mass Spectrometry, Applied Spectroscopy, Chemical Physics Physical Chemistry, Journal of Inclusion Phenomena and Macrocyclic Chemistry, Chinese Journal of Chemistry, Iranian Journal of Chemistry, Journal of Difference Equations, Life, Journal of Colloid and Interface Science, Review of Scientific Instruments, Nano, PLoS ONE, EPJ Techniques and Instruments*

Served on 26 review panels for NSF and NASA (2004–present), including 4 times as a panel chair and 9 times as a sub-panel chair; served on 3 NASA mission transition briefing teams

## Courses Taught

Chemistry 195 Freshman Seminar (2012)  
Chemistry 227 Principles of Analytical Chemistry (2006–2009, 2014)  
Chemistry 297R Research Training Experience (2018)  
Chemistry 391 Technical Writing using Chemical Literature (2014–2018)

Chemistry 497R Mentored Learning in Analytical Chemistry (2015–2016)  
Chemistry 521 Instrumental Analysis Lecture (2009–2012, 2018)  
Chemistry 523 Instrumental Analysis Lab (2010–2013, 2015, 2019)  
Chemistry 629R Mass Spectrometry (2016, 2018)  
Chemistry 692R Current Topics in Chemical Instrumentation (2017–2018)  
Chemistry 729R Special Topics in Mass Spectrometry (2005 & 2008)

## Publications

- Turner, B.; Anupriya, A.; Osburn-Staker, S.; De la Cruz, A.; Crowther, P.; Sweet, L.R.; Sevy, E.T.; Austin, D.E. A Microchannel Thermalization Inlet to Reduce Molecular Fragmentation in Orbital and Flyby Closed-Source Mass Spectrometers. *Planetary and Space Sciences*, **in review**.
- Decker, T.K.; Zheng, Y.; McClellan, J.S.; Ruben, A.J.; Lammert, S.A.; Austin, D.E.; Hawkins, A.R. Double Resonance Ejection Using Novel RF Phase Tracking Circuitry in a Miniaturized Planar Linear Ion Trap Mass Spectrometer, *Rapid Comm. Mass Spectrom.*, 2018, **in press**, doi: 10.1002/rcm.8267.
- Austin, D.E. and Lammert, S.A. “Mass Analyzer Miniaturization,” in the Encyclopedia of Mass Spectrometry, vol 7. Elsevier, **in press**.
- Decker, T.K.; Zheng, Y.; Ruben, A.J.; Wang, X.; Lammert, S.A.; Austin, D.E.; Hawkins, A. Microscale Planar Linear Ion Trap Mass Spectrometer. *J. Am. Soc. Mass Spectrom.*, **in press**.
- Tian, Y.; Decker, T.K.; McClellan, J.S.; Wu, Q.H.; De la Cruz, A.; Hawkins, A.R.; Austin, D.E. Experimental Observation of the Effects of Translational and Rotational Electrode Misalignment on a Planar Linear Ion Trap Mass Spectrometer, *J. Am. Soc. Mass Spectrom.*, **2018**, 29, 1376-1385.
- Decker, T.K.; Tian, Y.; McClellan, J.S.; Bennett, L.; Lammert, S.A.; Austin, D.E.; Hawkins, A.R. Optimal fabrication methods for miniature coplanar ion traps, *Rapid Comm. Mass Spectrom.*, **2018**, 32, 289-294.
- Wang, X.T.; Zheng, Y.; Shi, J.; Gong, X.Y.; Yue, J.; Han, W.W.; Jiang, Y.; Austin, D.E.; Fang, X.; Zhang, Z.P. Elucidating the Reaction Mechanisms between Triazine and Hydrogen Sulfide with pH Variation Using Mass Spectrometry, *Analytical Chemistry*, **2018**, 90, 11138-11145.
- Higgs, J.; Warnick, K.F.; Austin, D.E. Field optimization of toroidal ion trap mass analyzers using toroidal multipoles. *International Journal of Mass Spectrometry*, **2018**, 425, 10-15.
- Tian, Y.; Decker, T.K.; McClellan, J.S.; Bennett, L.; Li, A.; De la Cruz, A.; Andrews, D.; Lammert, S.A.; Hawkins, A.R.; Austin, D.E. Improved miniaturized linear ion trap mass spectrometer using lithographically patterned plates and tapered ejection slit, *J. Am. Soc. Mass Spectrom.* **2018**, 29, 213–222.

- Barney, B.; Austin, D.E. Kinetic energy loss of bouncing *Bacillus subtilis* spores determined using image-charge detection, *J. Biol. Phys.* **2017**, 43, 481-492.
- Li, A.; Higgs, J.; Austin, D.E. Chaotic motion of single ions in a toroidal ion trap mass analyzer, *Int. J. Mass Spectrom.* **2017**, 421, 95–103.
- Wang, T.; Zheng, Y.; Wang, X.; Austin, D.E.; Zhang, Z.P. Sub-ppt Mass Spectrometric Detection of Therapeutic Drugs in Complex Biological Matrices Using Polystyrene Microsphere-Coated Paper Spray, *Anal. Chem.* **2017**, 89, 7988–7995.
- Wang, T.; Zheng, Y.; Wang, X.; Wang, Q.; Ke, C.-Y.; Austin, D.E.; Han, X.; Zhang, Z. Abnormal Adsorption and Desorption Behaviors of Pharmaceutical Drugs on Polystyrene Microspheres, *Adv. Royal Soc. Chem.* **2017**, 7, 19639–19644.
- Wu, Q.H.; Li, A.; Tian, Y.; Decker, T.; Hawkins, A.R.; Austin, D.E. A miniaturized linear wire ion trap with electron ionization and single photon ionization sources, *J. Am. Soc. Mass Spectrom.* **2017**, 28, 859–865.
- Wu, Q.H.; Li, A.; Tian, Y.; Zare, R.N.; Austin, D.E. Miniaturized Linear Wire Ion Trap Mass Analyzer, *Anal. Chem.* **2016**, 88, 7800–7806.
- Barney, B.; Pratt, S.N.; Austin, D.E. Survivability of bare, individual *Bacillus subtilis* spores to high-velocity surface impact: implications for microbial transfer through space, *Planet. Space Sci.* **2016**, 125, 20–26.
- Higgs, J.M.; Petersen, B.V.; Lammert, S.A.; Warnick, K.F.; Austin, D.E. Radiofrequency trapping of ions in a pure toroidal potential distribution, *International Journal of Mass Spectrometry*, **2016**, 395, 20–26.
- Wu, Q.; Tian, Y.; Li, A.; Austin, D.E. Simulations of electrode misalignment effects in two-plate linear ion traps, *International Journal of Mass Spectrometry*, **2015**, 393, 52–57.
- Chadderdon, S.; Shumway, L.; Powell, A.; Li, A.; Austin, D.E.; Hawkins, A.R.; Selfridge, R.H.; Schultz, S.M. “Ion trap electric field measurements using slab coupled optical fiber sensors,” *Journal of the American Society for Mass Spectrometry*, **2014**, 25 (9), 1622-1627.
- Higgs, J.M.; Austin, D.E. “Ion Motion in Toroidal Radiofrequency Ion Traps,” *International Journal of Mass Spectrometry*, **2014**, 363, 40-51.
- Tian, Y.; Li, A.; Higgs, J.M.; Barney, B.L.; Austin, D.E. “How Far Can Ion Trap Miniaturization Go? Parameter Scaling, Space Charge Limits, and Future Prospects,” *Journal of Mass Spectrometry* (cover article), **2014**, 49 (3), 233-240.
- Li, A.; Hansen, B.J.; Powell, A.; Hawkins, A.R.; Austin, D.E. “Miniaturization of a Planar-Electrode Linear Ion Trap Mass Spectrometer,” *Rapid Communications in Mass Spectrometry*, **2014**, 28 (12), 1338-1344.

- Pratt, S.; Austin, D.E. "Bacterial spores survive electrospray charging and desolvation," *Journal of the American Society for Mass Spectrometry*, **2014**, 25 (5), 712-721.
- Barney, B.; Daly, R.T.; Austin, D.E. "A Multi-stage Image Charge Detector Made from Printed Circuit Boards," *Review of Scientific Instruments*, **2013**, 84, 114101; doi: 10/1063/1.4828668.
- Hansen, B.J.; Niemi, R.J.; Hawkins, A.R.; Lammert, S.A.; Austin, D.E. "A Lithographically Patterned Discrete Planar Electrode Linear Ion Trap Mass Spectrometer," *Journal of Microelectromechanical Systems (JMEMS)*, **2013**, 22 (4), 876-883.
- Daly, R.T.; Kerby, J.; Austin, D.E. "Electrospray Charging of Minerals and Ices for Hypervelocity Impact Research," *Planetary and Space Science*, **2013**, 75, 182-187.
- Kerby, J.; Daly, R.T.; Austin, D.E. "Electrical Charging of Chondritic Meteorite Particles, Other Minerals, and Ices for Hypervelocity Impact Research," *Earth, Planets, Space (EPS)*, **2013**, 65, 157-165.
- Taylor, N.; Austin, D.E. "A Simplified Toroidal Ion Trap Mass Spectrometer," *International Journal of Mass Spectrometry*, **2012**, 321-322, 25-32.
- Austin, D.E.; Shen, A.H.T.; Beauchamp, J.L.; Ahrens, T.J. "Time-of-flight mass spectrometry of mineral volatilization: toward composition analysis of shocked mineral vapor," *Review of Scientific Instruments*, **2012**, 83 (4) 044502, 1-6.
- Selck, D.A.; Woodfield, B.F.; Boerio-Goates J.; Austin, D.E. "Simple, Low-Cost Mass Spectrometric Analyzer for Thermogravimetry," *Rapid Communications in Mass Spectrometry*, **2012**, 26, 78-82.
- Peng, Y.; Austin, D.E. "New Approaches for Miniaturizing Ion Trap Mass Analyzers," *TrAC--Trends in Analytical Chemistry*, **2011**, 30 (10), 1560-1567.
- Peng, Y.; Hansen, B.J.; Quist, H.; Zhang, Z.; Hawkins, A.R.; Austin, D.E. "Coaxial Ion Trap: Concentric Toroidal and Quadrupole Trapping Regions in One Mass Analyzer," *Analytical Chemistry*, **2011**, 83 (14) 5578-5584.
- Wang, M., Quist, H. E., Hansen, B.J., Peng, Y., Zhang, Z., Hawkins, A.R., Rockwood, A.L., Austin, D.E., Lee, M.L., "Performance of a Halo Ion Trap Mass Analyzer with Exit Slits for Axial Ejection," *Journal of the American Society for Mass Spectrometry*, **2011**, 22 (2), 369-378.
- Zhang, Z., Quist, H., Peng, Y., Hansen, B.J., Wang, J., Hawkins, A.R., Austin, D.E., "Effects of Higher-Order Multipoles on the Performance of a Two-Plate Quadrupole Ion Trap Mass Analyzer," *International Journal of Mass Spectrometry*, **2011**, 299 (2-3), 151-157.
- Austin, D.E.; Hansen, B.J., Peng, Y.; Zhang, Z. "Multipole Expansion in Quadrupolar Devices Comprised of Planar Electrode Arrays," *Int. J. Mass Spectrometry*, **2010**, 295 (3), 153-158.

Clark, J., Call, S. T., Austin, D.E., Hansen, J.C. "Computational Study of Hydroxy Isoprene Peroxy Radical-Water Complexes," *Journal of Physical Chemistry A*, **2010**, 114 (23), 6534-6541.

Austin, D.E. "Mass Spectrometry on a Chip – or Between Two," *G.I.T. Laboratory Journal – Europe*, **2010** (5-6), 20-22.

Austin, D.E. and Lammert, S.A. "Ion Traps with Circular Geometry," Chapter 7 in Volume 4 of *Practical Aspects of Trapped Ion Mass Spectrometry*, Todd, J.F.J and March, R. Eds. CRC Press, **2010**.

Zhang, Z., Y. Peng, B.J. Hansen, I.W. Miller, M. Wang, M.L. Lee, A.R. Hawkins, D.E. Austin. "Paul Trap Mass Analyzer Consisting of Opposing Microfabricated Electrode Plates," *Analytical Chemistry*, **2009**, 81, 5241-5248.

Austin, D.E. Peng, Y., Hansen, B.J., Miller, I.W., Rockwood, A., Hawkins, A.R., Tolley, S.E. "Novel Ion Traps using Planar Resistive Electrodes: Implications for Miniaturized Mass Analyzers," *Journal of the American Society for Mass Spectrometry*, **2008**, 19, 10, 1435-1441.

Austin, D.E., M. Wang, S.E. Tolley, J.D. Maas, A.R. Hawkins, A.L. Rockwood, H.D. Tolley, E.D. Lee, M.L. Lee "Halo ion trap mass spectrometer," *Analytical Chemistry*, **2007**, 79, 2927-2932.

Cruz, D., J.P. Chang, M. Fico, A.J. Guymon, D.E. Austin, M.G. Blain, "Design, microfabrication, and analysis of micrometer-sized cylindrical ion traps," *Rev. Sci. Instrum.*, **2007**, 78, 015107.

Austin, D.E., D. Cruz, M.G. Blain "Simulations of ion trapping behavior in micrometer-sized cylindrical ion traps," *J. Am. Soc. Mass Spectrometry*, **2006**, 17(3), 430-441.

Austin, D.E.; Hunka, D.E., "An ion mobility spectrometer mass spectrometer (IMS-MS) for improved detection of contraband," SAND report #2005-6360, **2005**, Sandia National Laboratories, Albuquerque, NM.

Austin, D.E., H.L.K. Manning, C.L. Bailey, J.L. Beauchamp "A Compact Time-of-flight Mass Spectrometer for High-flux Cosmic Dust Analysis," *Journal of Geophysical Research - Planets* **2004**, 109, E07S07, doi:10.1029/2003JE002184.

Blain, M.G., L.S. Riter, D. Cruz, D.E. Austin, G. Wu, W.R. Plass, R.G. Cooks "Towards the hand-held mass spectrometer: design considerations, simulation, and fabrication of micrometer-scaled cylindrical ion traps," *International Journal of Mass Spectrometry* **2004**, 236 91-104.

Austin, D.E.; R.L. Grimm, H.L.K. Manning, C.L. Bailey, J.E. Farnsworth, T.J. Ahrens, J.L. Beauchamp "Hypervelocity microparticle impact studies using a novel cosmic dust mass spectrometer," *Journal of Geophysical Research - Planets* **2003**, 108(E5) 503, doi:10.1029/2002JE001947.

Austin, D.E., T.J. Ahrens, J.L. Beauchamp “Dustbuster: a compact impact-ionization time-of-flight mass spectrometer for in situ analysis of cosmic dust,” *Rev. Sci. Instrum.* **2002**, 73(1) 185-189.

## **Recent Invited Talks at National and International Professional Meetings**

Austin, D.E. “Lithographically Patterned Electrodes for Miniaturized Ion Trap Mass Spectrometers and Other Ion Optics Devices,” to be presented at the International Mass Spectrometry Conference, Florence, Italy, August 2018

Austin, D.E. “Electrode Misalignment on a Planar Linear Ion Trap Mass Spectrometer, and Implications for Portable GC-MS,” to be presented at the International Conference on Separation Science and Technology, Dubai, U.A.E., April 2018

Austin, D.E.; Wu, Q.; Zare, R.N.; Li, A.; Tian, Y.; Hawkins, A.R.; Andrews, D.; Decker, T.; McClellan, J. “Miniaturized Wire Ion Trap,” presented at the Pittsburgh Conference on Analytical Chemistry, 5–9 March 2017, Chicago, IL.

Austin, D.E. “Sub-millimeter linear ion traps to address space-charge limits in portable mass spectrometry,” presented at the International Chemical Congress of the Pacific Basin Societies, 15–20 December 2015, Honolulu, HI.

Austin, D.E. “Microfabricated Ion Trap Mass Spectrometers for in situ Analysis,” presented at the 2015 Analytix Conference, April 2015, Nanjing, China.

Austin, D.E. “Progress in Portable Mass Spectrometry,” presented at the Pittsburgh Conference on Analytical Chemistry, March 2015, New Orleans, LA.

Li, A.; Hansen, B.J.; Tian, Y.; Powell, A.T.; Hawkins, A.R.; Austin, D.E. “Sub-mm linear ion trap mass spectrometer made using ceramic plates,” presented at the 248th American Chemical Society National Meeting, August 10–14, 2014, San Francisco, CA.

Austin, D.E. “Ion Trap Mass Analyzers: the Next Steps,” presented at the Ion Trap Interest Group workshop of the 62<sup>nd</sup> Conference of the American Society for Mass Spectrometry, 15–19 June 2014, Baltimore, MD.

Austin, D.E. “Converging ion traps for miniaturized mass spectrometers,” presented at the Pittsburgh Conference on Analytical Chemistry, March 2013, Philadelphia, PA.

Austin, D.E. Peng, Y.; Zhang, Z.; Hansen, B.J.; Hawkins, A.R. “Ion Trap Mass Analyzers Consisting of Lithographically Patterned Plates,” presented at the meeting of the Federation of Analytical Chemistry and Spectroscopy Societies, October 2011, Reno, NV.

Austin, D.E. “Mass Spectrometry on a Chip—or Between Two,” presented at the 3rd Annual Meeting of the Center for Analytical Instrument Development, Purdue University, June 2010.

Austin, D.E. Presentation at the U.S. Department of Energy (DOE) Separations and Analysis Contractors’ Meeting, April 2010, Baltimore, MD.

Hansen, B.J.; Quist, H.E.; Hawkins, A.R.; Zhang, Z.; Peng, Y.; Wang, M.; Lee, M.L.; Austin, D.E. “Quadruple Ion Traps Realized by Planar Microfabricated Electrodes for Compensation of High Order Multipole Effects,” presented at the Pittsburgh Conference on Analytical Chemistry, 28 Feb–4 March 2010, Orlando, FL.

Austin, D.E. "Microfabricated Planar Electrode Ion Traps: Combining Accuracy with Simplicity for Miniaturization," presented at the Pittsburgh Conference on Analytical Chemistry, 28 Feb–4 March 2010, Orlando, FL.

## **Patents**

Tolley, S.E., Austin, D.E., Hawkins, A.R., Lee, E.D. "Coaxial Hybrid Radio Frequency Ion Trap Mass Analyzer," U.S. Patent # 7,723,679, filed 25 Feb 2008, issued 25 May 2010.

Austin, D.E., Taylor, N. Toroidal Ion Trap Mass Analyzer with Cylindrical Electrodes, U.S. Patent 8642955, filed 20 August 2012, issued 4 February 2014.