CURRICULUM VITAE

Luther Beegle
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Currently, I am the group supervisor for the Instrument Development and Spectroscopy Research Element at JPL. I am an experimental astrophysicist by training and have extensive experience developing and designing instrumentation such as organic molecule extract techniques, charged particle optics, ion mobility spectrometers, and cylindrical ion trap mass spectrometers for space and terrestrial applications. In addition, a current area of research is how robotic sample acquisition techniques physically and chemically alter the volatile components of samples on current and future in situ missions.

Education

University of Alabama at Birmingham	Ph.D.	1997	Astrophysics
A Model of the Complex Hydrocarbon Component of the Interstellar Medium: Observational and Experimental Considerations			
University of Alabama at Birmingham	MS	1995	Physics
University of Delaware	BS	1990	Physics/Astronomy

Present Position:

2005-present Group Supervisor Group 3225, Advanced Instrumentation and Spectroscopy research Group, Science Research Division, Jet Propulsion Laboratory, California Institute of Technology.

- Supervised a research group of 8 to 15 Ph.D. scientist

2003-present: Research Scientist, Jet Propulsion Laboratory, California Institute of Technology, Pasadena California. Responsibilities include:

- Conduct NASA funded research as a PI and Co-I on the extraction, collection, detection and identification of organic molecules as part of a future *in situ* rover platform.
- Conduct concept studies to define the science payload of a future mars mission, the Astrobiology Field Laboratory, Mars polar cap missions, and Human Precursor missions to explore the Martian surface.
- Member of NASA Instrument Cost Model Development team.
- Science Co-Chair for Team-X specializing in the costing of new frontier missions.

Past Positions:

2008-2009 Deputy Investigation scientist on the MSL SASHaP system. Ran experiments determining the best way to acquire and transfer samples on the MSL rover.

2001-2003: Scientist, Jet Propulsion Laboratory, California Institute of Technology, Pasadena California. Conduct NASA funded research as a PI and Co-I on the

collection, extraction, detection and identification of organic molecules as part of a future *in situ* rover platform.

1999- 2001: Postdoctoral Scholar, California Institute of Technology, Pasadena California Developing analytical instrumentation techniques for the *in-situ* search for organic molecules. Conducting astrobiological experiments that will help elucidate conditions organic molecules might face on extraterrestrial planets.

1997- 1999: National Research Council Post-Doctoral Scholar, Jet Propulsion Laboratory, California Institute of Technology, Pasadena California. Preformed first ever temperature dependent absorption spectroscopy of atmospherically important species. Preformed electron impact studies on the atmospherically important species of CO and SO_2.

1996: Instructor, PHS110, An Overview of Space Exploration, The University of Alabama at Birmingham.

1993-1997: Research Assistant, The University of Alabama at Birmingham, under NASA programs: Origins of Solar Systems, Exobiology, UV Astronomy, and IR Astronomy. Investigated interstellar molecules and ions which make up the interstellar medium and are responsible for several Astronomical features including the 2175 Å bump, Unidentified Infrared bands, and Diffuse Interstellar Bands (UV Astronomy, IR Astronomy and Origins of Solar Systems). Addition investigations included work on the miniaturization of a laser Raman spectrometer (PIDDP), and identifying carbonaceous material in ancient terrestrial rock samples as Martian Analogs (Exobiology).

1991-1993: Teaching Assistant, the University of Alabama at Birmingham. Taught Classical Mechanics laboratory for majors and non majors, Thermodynamics for majors, Electricity and Magnetism for majors, and Modern Physics for majors.

Funded Proposals (PI):

Development of an automated sample preparation system (ASPS), Mars Instrument Development Program (MIDP), 3 years, $1,573K. 2008-11.

A Novel Field-Induced Droplet Ionization (FIDI) for the in situ detection of organic molecules, JPL Directors Research and Development Fund, 1 yr, $199,000. 2007-8

Microbiology of the Cima Lava Fields, JPL Research and Technology Development Program, 4 Months, $30K. 2007.

Diffusion of Methane through regolith under simulated Martian Conditions, JPL Research and Technology Development Program, 1 yr, $81,000. 2006.

Microwave Enhanced Extraction of Organic Molecules from Soil and Rock Samples, NASA Astrobiology Science and Technical Instrument Development (ASTID), 3 Yrs, $650,000. 2004-2006.

A Laboratory Proof-of-Concept Study of an Organic Molecule Collector/Preconcentrator for Future Planetary Missions, NASA Astrobiology Science and Technical Instrument Development (ASTID), 3 Yrs, $400,000, 2002-2005.

Microwave enhanced extraction of organic molecules from rock and soil samples. JPL Director's Research and Development Fund, 1 year $40,000, 2002.

Funded Proposals (Co-I):

Co-Investigator on 15 peer-reviewed proposals which were funded under 7different NASA programs: ASTEP, MIDP, PIDDP, ASTID, Vision Missions, Origins of Solar Systems, Exobiology and UV/VIS Astrophysics.

Funded Proposals (Task Manager-Co-I):

Advanced Robotic Detection of Chemical/Biological Agents, Toxic Industrial Gases and IEDS for Force Health Protection PHASE II SBIR from the Army. Small Business point of contact: IonFinity, *LLC*. 2.5 years, $225K. 2008

Miniature Electric Sniffer for Navy Vertical Take-Off Unmanned Aerial Vehicle (VTUAVS) SBIR from the Army. Small Business point of contact: IonFinity, *LLC*. 2 years, $225K. 2008.

Awards and Recognitions:

NASA Group Achievement Award for development of the NASA Instrument Cost Model (2007)
Team Bonus Award: 2004 (Mars Next Decade Study Team, In situ Sample Processing Team),
2005 (Mars Roadmapping Support Team)
TAP Group achievement award (1997)
Outstanding Physics Graduate Student (1996-97) The University of Alabama at Birmingham

Laboratory and Field Analysis Techniques:

- Infrared Spectroscopy
- Visible Spectroscopy
- Vacuum Ultraviolet Spectroscopy
- Laser Raman Spectroscopy
- Ion Mobility Spectroscopy
- Ion Trap Mass Spectroscopy
- Quadrupole Mass Spectroscopy
- MALDI/ Time-of-Flight Spectroscopy
- Quadrupole Mass Spectroscopy
- Scanning Electron Microscopy
- High Performance Liquid Chromatography
- Electrospray and nanospray Ionization/Mass Spectroscopy

Professional Activities:

- Editor, *Astrobiology* Journal
- Member of the Astrobiology Science Steering Group to define Astrobiological objectives for future Mars missions (2004)
- Member of the Mars Human Precursor Science Steering group defining risks and measurements needed for human exploration of Mars (2005)
- Member of the American Association for the Advancement of Science, the International Society of Ion Mobility Spectroscopy, and the American Geophysical Union.
- Worked with the University of Alabama at Birmingham's Media Relations department as science expert for local interviews with television stations and news papers.

- Worked with education outreach at University of Alabama at Birmingham as guest lecturer at local schools (elementary, middle and high).
- Judge for the Alabama Science Olympiad (1995, 1996, 1997).
- Mail in reviewer for PIDDP program (2001, 2004, 2005, 2006)
- Member of review panel for Laboratory Astrophysics program (2007)
- Reviewer for Planetary and Space Science, Astrobiology, and Analytical Chemistry
- Reviewer for NASA Mars Fundamental Research Program (2005)
- Organized topical session "Mars Analogue Research and Instrument Field Testing" for The Geological Society of America Annual Meeting, Salt Lake City, October, 2005.

Patents:

- Proton-Transfer Reaction/Ion Mobility Spectrometer. Developed a novel high-pressure hollow cathode ionizer for use in ambient Martian environments. Patent number: 6,794,645 B2, 21 September 2004.
- Development of an automated de-salting apparatus. Patent applied for. NPO 45428

Publications:

Beegle, L.W., G. H. Peters, R. C. Anderson, R. Bhartia, A. G. Ball, and L. Sollitt. "Particle Sieving and Sorting Under Simulated Martian Conditions." Submitted to Icarus 2009.

Kim, H. I., H. Kim, E. Pang, **L. W. Beegle**, J. Loo, W. A. Goddard and I. Kanik, "Structural Characterization of Phospholipids Using Traveling Wave Ion Mobility Spectrometry in N2," Submitted to Analytical Chemistry (2009).

Kim, H. I., Y. Shin, H. Kim, **L. W. Beegle**, J. Heath, W. Goddard, I. Kanik, and J. L. Beauchamp, "Investigation of Air-Liquid Interfacial Activities of Surfactant Lipids: Chemical and Physical Alteration of Surfactant under Oxidative Stress." Submitted to Proceedings of the National Academies of Science, (2009).

Anderson R. C., **L. W. Beegle***, Gregory H. Peters, G. Fleming, L.Jandura, K. Kriechbaum, K. Manatt, A. Okon, E. Pounders, L. Sollitt, and D. Sunshine, Particle Transport and Distribution on the Mars Science Laboratory Mission: Effects of Triboelectric charging. Submitted to Icarus (2009).

G.H. Peters, G. S. Mungas, G. H. Bearman, S. Douglas, W. Abbey, R.C. Anderson, and **L. W. Beegle*** (2008). Mojave Mars Simulant – a New Approach to Martian Soil Simulants. Icarus 197(2): 470-479.

Liu, D., **L. W. Beegle***, and I. Kanik. (2008). Analysis of Underivatized Amino Acids of Geological Interest using Ion-Pairing Liquid Chromatography/Electrospray Ionization/Tandem Mass Spectrometry. Astrobiology 8(2), 229-241 doi: 10.1089/ast.2007.0176

Kim, H, H. I. Kim, P. V. Johnson, **L. W. Beegle***, J. L. Beauchamp, W. A. Goddard, and I. Kanik (2008). An Experimental and Theoretical Investigation into the Correlation between Mass and Ion Mobility for Choline and Other Ammonium Cations in N_2 Analytical Chemistry 80 (6), 1928-1936 doi: 10.1021/ac701888e.

Peters, G. H., J. A. Smith, G. S. Mungas, G. H. Bearman, L. Shiraishi and **L. W. Beegle*** (2008). RASP based sample acquisition of analogue Martian permafrost samples: Implications for NASA's Phoenix scout mission, Planetary and Space Science 56 (3-4), 303-309 doi:10.1016/j.pss.2007.10.001.

Beegle, L. W.*, M. G. Wilson, F. Abilleira, J. F. Jordan and G. R. Wilson (2007). A concept for NASA's mars 2016 astrobiology field laboratory. Astrobiology 7 (4): 545-577.

Johnson, P. V., **L. W. Beegle**, H. I. Kim, G. A. Eiceman and I. Kanik (2007). Ion mobility spectrometry in space exploration. International Journal of Mass Spectrometry 262 (1-2): 1-15.

Mix, L. J., J. C. Armstrong, A. M. Mandell, A. C. Mosier, J. Raymond, S. N. Raymond, F. J. Stewart, K. von Braun, O. Zhaxybayeva, L. Billings, V. Cameron, M. Claire, G. J. Dick, S. D. Domagal-Goldman, E. J. Javaux, O. J. Johnson, C. Laws, M. S. Race, J. Rask, J. D. Rummel, R. T. Schelble, S. Vance, Z. Adam, P. Backus, **L. Beegle,** J. Bishop, K. Boering, M. Briley, W. Calvin, D. Catling, C. Cleland, K. E. Dodson, J. Fletcher, E. D. Acosta, I. de Zwart, J. Eigenbrode, J. Farmer, S. Frank, P. Gogarten, E. Goolish, R. Grymes, N. Haghighipour, T. Hudson, V. Ivkovic, M. Jahangeer, B. Jakosky, S. Kenyon, S. Kilston, A. Knoll, E. Korpela, D. Lamb, J. Lazio, R. Lenski, L. Link, K. Lloyd, J. Lunine, M. Manga, T. McCoy, K. Meech, G. Mello, S. Mojzsis, D. Morrison, O. Morton, D. Moser, K. Nealson, F. Nimno, R. Norris, E. Offerdahl, T. Olien, N. Pace, S. Pfiffner, C. Philips, S. Rao, D. Rodriquez, J. Rummel, B. Schopf, S. Seager, N. Sleep, M. Sogin, N. Solovaya, W. Sullivan, B. Thomas, T. Thorsteinsson, C. Tomow, M. Wevrick, N. Woolf, K. Yamaguchi and M. Zerella (2006). The astrobiology primer: An outline of general knowledge - Version 1, 2006. Astrobiology 6 (5): 735-813.

Kim, H. I., P. V. Johnson, **L. W. Beegle,** J. L. Beauchamp and I. Kanik (2005). Electrospray ionization ion mobility spectrometry of carboxylate anions: Ion mobilities and a mass-mobility correlation. Journal of Physical Chemistry A 109 (35): 7888-7895.

Boynton, J. G. Mungas, C. Sepulveda, M. Balzer, **L. W. Beegle,** H. Hobel, T. Fisher, D. Klein, M. Deans, and P. Lee. CHAMP: Camera Hand lens, and Microscope Probe. IEEEAC paper 1510, 2005.

Johnson, P. V., H. I. Kim, **L. W. Beegle** and I. Kanik (2004). Electrospray ionization ion mobility spectrometry of amino acids: Ion mobilities and a mass-mobility correlation. Journal of Physical Chemistry A 108 (27): 5785-5792.

Ajello, J. M., D. L. Hansen, **L. W. Beegle**, C. A. Terrell, I. Kanik, G. K. James and O. P. Makarov (2002). Middle ultraviolet and visible spectrum of SO2 by electron impact. Journal of Geophysical Research-Space Physics 107 (A7.

Beegle, L. W., I. Kanik, L. Matz and H. H. Hill (2002). Effects of drift-gas polarizability on glycine peptides in ion mobility spectrometry. International Journal of Mass Spectrometry 216 (3): 257-268.

Matz, L. M., H. H. Hill, **L. W. Beegle** and I. Kanik (2002). Investigation of drift gas selectivity in high resolution ion mobility spectrometry with mass spectrometry detection. Journal of the American Society for Mass Spectrometry 13 (4): 300-307.

Kanik I. and **L.W. Beegle**. Portable Instrument Detects Very Dilute Airborne Organics. NASA Tech Briefs, 71-72, March 2002.

Beegle, L. W., I. Kanik, L. Matz and H. H. Hill (2001). Electrospray ionization nigh-resolution ion mobility spectrometry for the detection of organic compounds, 1. Amino acids. Analytical Chemistry 73 (13): 3028-3034.

Beegle, L. W., T. J. Wdowiak and J. G. Harrison (2001). Hydrogenation of polycyclic aromatic hydrocarbons as a factor affecting the cosmic 6.2 micron emission band. Spectrochimica Acta Part a-Molecular and Biomolecular Spectroscopy 57 (4): 737-744.

Kanik, I., **L. W. Beegle,** J. M. Ajello and S. C. Solomon (2000). Electron-impact excitation/emission and photoabsorption cross sections important in the terrestrial airglow and auroral analysis of rocket and satellite observations. Physics and Chemistry of the Earth Part C-Solar-Terrestial and Planetary Science 25 (5-6): 573-581.

Arnoult, K. M., T. J. Wdowiak and **L. W. Beegle** (2000). Laboratory investigation of the contribution of complex aromatic/aliphatic polycyclic hybrid molecular structures to

interstellar ultraviolet extinction and infrared emission. Astrophysical Journal 535 (2): 815-822.

Beegle, L. W., J. M. Ajello, G. K. James, D. Dziczek and M. Alvarez (1999). High resolution emission spectroscopy of the A (1)Pi-X (1)Sigma(+) fourth positive band system of CO excited by electron impact. Astronomy and Astrophysics 347 (1): 375-390.

Kanik, I., **L. Beegle,** C. Noren, S. M. Ahmed and R. Link (1997). Temperature-dependent photoabsorption cross section measurements of O-2 at the NI airglow and auroral emission Lines. Chemical Physics Letters 279 (5-6): 297-302.

Beegle, L. W., T. J. Wdowiak, M. S. Robinson, J. R. Cronin, M. D. McGehee, S. J. Clemett and S. Gillette (1997). Experimental indication of a naphthalene-base molecular aggregate for the carrier of the 2175 angstrom interstellar extinction feature. Astrophysical Journal 487 (2): 976-982.

Beegle, L. W., T. J. Wdowiak and K. M. Arnoult (1997). A laboratory analog for the carrier of the 3 micron emission of the protoplanetary nebula IRAS 05341+0852. Astrophysical Journal 486 (2): L153-L155.

Robinson, M. S., **L. W. Beegle** and T. J. Wdowiak (1997). Inference of a 7.75 eV lower limit in the ultraviolet pumping of interstellar polycyclic aromatic hydrocarbon cations with resulting unidentified infrared emissions. Astrophysical Journal 474 (1): 474-478.

Wdowiak, T. J., W. Lee, J. Cronin, **L. W. Beegle** and M. S. Robinson (1995). Plasma Processing of Interstellar Pahs into Solar-System Kerogen. Planetary and Space Science 43 (10-11): 1175-1182.

Robinson, M. S., **L. W. Beegle** and T. J. Wdowiak (1995). Spectroscopy of PAH Species in the Gas-Phase. Planetary and Space Science 43 (10-11): 1293-1296.

Wdowiak, T. J., **L. W. Beegle**, M. S. Robinson and W. Lee (1995). Dibs in Captivity. Planetary and Space Science 43 (10-11): 1429-1435.

Book Chapters:

Beegle, L. W., S. Feldman, P. Johnson C. B. Dreyer (2009) Instruments for *In-Situ* Sample Analysis in Drilling in Extreme Environments: Penetration and Sampling on Earth and other Planets. Eds. Y. Bar-Cohen and K. Zacny. John Wiley & Sons. ISBN: 978-3-527-40852-8.

Invited Talks:

L.W. Beegle. Palmer Quest: A Mission to the Martian Polar Caps. Committee on Science Opportunities Enabled by NASA's Constellation System, National Research Council, Washington, DC. February 21, 2008.

L.W. Beegle. Mars Exploration: Past, Present and Future. The University of Nevada Las Vegas, November 2006.

L.W. Beegle. Status of Astrobiology Instrument Development, National Research council for Astrobiology. Space Studies Board's Mars Astrobiology Strategy Committee, Washington DC May 11, 2006.

L.W. Beegle. Sample handling and planetary protection for in situ analysis and sample return. Workshop on Mars Astrobiology Science and Technology. Carnegie Institution of Washington. 8-10 September 2004.

L. W. Beegle. Temperature Dependent photoabsorption Cross Sections Measurements at the Aeronomicly Important Wavelengths. TIGRE Conference, Friburg Germany 1999.

NASA Publications:

H. Habib-Agahi et al. NASA Instrument Cost Model (NICM). JPL Document#982-0000 Rev. 1, October, 2006.

Contributed to: D. W. Beaty, et al. An Analysis of the Precursor Measurements of Mars Needed to Reduce the Risk of the First Human Mission to Mars. JPL Document CL#05-0381, 2005

T. J. Wdowiak, D. G. Agresti, S. B. Mirov, A. B. Kudryavtsev, **L. W. Beegle**, D. J. DeMarais, and A. F. Tharpe. Identification of Ancient Carbonaceous Cherts on Mars Using Raman Spectroscopy. Conference on Early Mars (Lunar and Planetary Institute, Houston Texas) LPI No. 916, 81, 1997.

T. J. Wdowiak, D. G. Agresti, S. B. Mirov, A. B. Kudryavtsev, and **L. W. Beegle.** Instrumental Considerations for the Exobiological Exploration of Europa. Europa Ocean Conference (San Juan Capistrano Research Institute, San Juan Capistrano) Capistrano Conf. No. 5, 83-84 1996.

T. J. Wdowiak, **L. W. Beegle**, W. Lee, and M. S. Robinson. Investigation of a Laboratory Candidate for the Carrier of the 4428 Å Diffuse Interstellar Band. in The Diffuse Interstellar Bands, ed. A. G. G. M. Tielens (NASA CP-10144), 65-70, 1994.

Published Meeting Abstracts:

Guerrero, J., J. Craig, E. Olds, D. Towles, S. Casey, and L. Beegle, Advanced Robotic Drilling and Sample Handling Technology. AIAA Space 2009, Pasadena 2009.

Peters G. H. Mungas G. S. Murray S. D. Polk J. E. Lindeman R. Beegle L. Venus Analog Testbed for RASP and Sample Collection Testing Lunar and Planetary Science Conference XXXX Abstract #2518, Lunar and Planetary Institute, Houston 2009.

Anderson R. C. Peters G. H. Beegle L. Pounders E. Manatt K. Solitt L. Fleming G. Particle Transport on the Mars Science Laboratory Mission: Effects of Triboelectric Charging Lunar and Planetary Science Conference XXXX Abstract #1648, Lunar and Planetary Institute, Houston 2009.

Kim, H. I., L. W. Beegle, and J. L. Beauchamp Probing Interfacial Chemistry of Phospholipid Monolayers Using Field Induced Droplet Ionization Mass Spectrometry. Lipidomics and Lipids in Mass Spectrometry American Society for Mass Spectroscopy, Tampa 2009

Mungas, G. S., Y. Gürsel, C. A. Sepulveda, C. La Baw, K. R. Johnson, M. Deans, **L. Beegle,** J. Boynton Development and optical testing of the camera, hand lens, and microscope probe with scannable laser spectroscopy (CHAMPS). SPIE, 2008.

Beegle, L. W., P.V. Johnson, R. Hoydess, R. Mielke, G. E. Orzechowska, Luke Sollitt and I. Kanik Toward the in situ quantification of organic molecules in solid samples: Effects due to sample handling and processing, Goldschmidt2008, Vancouver Ca 2008.

Peters, G. H., **L. W. Beegle**, G. S. Mungas, R. C. Anderson, and G. H. Bearman Rapid Sample Acquisition and Processing for In Situ Missions., Lunar and Planetary Science Conference XXXIX Abstract #2278, Lunar and Planetary Institute, Houston 2008.

Sollitt, L. S. and **L. W. Beegle** Laser Infrared Desorption Spectroscopy to Detect Complex Organic Molecules on Icy Planetary Surfaces. Lunar and Planetary Science Conference XXXIX Abstract #2242, Lunar and Planetary Institute, Houston 2008.

Mungas, G. S., Y. Gursel, C. B. Dreyer , C. S. Sepulveda, K. R. Johnson, J. E. Boynton , **L. Beegle**, Integrating Micro-LIBS with the Camera, Hendlens and Microscope Probe for Space Exploration. Lunar and Planetary Science Conference XXXIX Abstract #2492, Lunar and Planetary Institute, Houston 2008

Beegle, L. W., M. G. Wilson, T. J. Schmidt and G. R. Wilson (2007). Current concept for NASA's 2016 astrobiology field laboratory. Astrobiology 7 (3): 479-479.

Peters, G., G. S. Mungas, G. H. Bearman, J. A. Smith, R. C. Anderson, **L. W. Beegle** and H. Sun (2007). Science investigations using a rapid active sampling package (RASP). Astrobiology 7 (3): 503-504.

Sollitt a L. S. nd **L. W. Beegle** Characterization of Methane Diffusion Through Simulated Martian Regolith. Lunar and Planetary Science Conference XXXVIII Abstract #1870, Lunar and Planetary Institute, Houston 2007

Mungas, G. S. G. H. Peters , J. A. Smith, G. H. Bearman, **L. W. Beegle**, C. Stuthers, J. Glucoft H2O Sublimation Alteration of Icy Martian Samples Due to Mechanical Work, Heat and Mass Transport. Lunar and Planetary Science Conference XXXVIII Abstract #2002, Lunar and Planetary Institute, Houston 2007

Beegle, **L. W.** G. H. Peters, G. S. Mungas, G. H. Bearman, J. A. Smith, R. C. Anderson. Mojave Martian Simulant: a New Martian Soil Simulant. Lunar and Planetary Science Conference XXXVIII Abstract #2005, Lunar and Planetary Institute, Houston 2007

Peters, G. H. G. S. Mungas, G. H. Bearman, **L. W. Beegle**, J.A. Smith. Characterization of RASP sample acquisition on the Phoenix MARS scout mission. Lunar and Planetary Science Conference XXXVIII Abstract #2008, Lunar and Planetary Institute, Houston 2007

Mungas, G. , **L.W. Beegle** et al. The alteration of icy samples during sample acquisition. AGU Fall meeting abstracts, 2006.

Guerrero J. L., et al. Robotic Drilling Technology and Applications to Future Space Missions. AGU Fall meeting abstracts, 2006.

Beegle, L. W., T.J. Schmidt, M.G. Wilson, and G.R. Wilson, A Concept for the Mars Astrobiology Field Laboratory. AGU Fall meeting abstracts, 2006.

Liu, D. L. **L. W. Beegle**, and I. Kanik. Ion-Pairing Liquid Chromatography/Electrospray Ionization Tandem Mass Spectrometric Analysis of 20 Underivatized Biotic Amino Acids of Geological Interest. HPLC 2006, San Jose, Ca. 2006

Sollitt L. and **L. W. Beegle**. Diffusion of methane through Martian regolith simulant. American Astronomical Society 208th Meeting Calgary, Canada 2006

Beegle, **L. W.,** J. Guerrero, S. Douglas, R. Kidd, A. L. Lane, M. Pelletier, S. Feldman, G. S. Mungas, D. Blake, R. Dissly, J. H. Waite, D. T. Young, H. Sun S. Wells and the MSE Team, The Mars Subsurface Explorer. AbSciCon, Washington DC, Astrobiology Vol. 6, p 232, 2006.

Kanik, I. **L. W. Beegle**, S. Kounaves, R. G. Cooks, M. Hecht and P. V. Johnson. Wet Chemistry Experiment at Mars (WetChem). AbSciCon, Washington DC, Astrobiology Vol. 6, p 257, 2006.

Liu, D.L. **L.W. Beegle**, and I. Kanik. Determining Underivatized Amino Acids by Ion-Pairing Liquid Chromatography and Tandem Mass Spectrometry. AbSciCon, Washington DC, Astrobiology Vol. 6, p 255, 2006.

Schmidt, T.J. **L.W. Beegle**, M.G. Wilson, and G.R. Wilson, A concept for the 2016 Mars Astrobiology Field Laboratory. AbSciCon, Washington DC, Astrobiology Vol 6, p 185, 2006.

Beegle, **L. W.** J. Guerrero, S. Douglas, R. Kidd, A. L. Lane, M. Pelletier, S. Feldman, G. S. Mungas, D. Blake, R. Dissly, J. H. Waite, D. T. Young, H. Sun S. Wells and the MSE Team, The Mars Subsurface Explorer. Lunar and Planetary Science Conference XXXVII, Abstract #1467, Lunar and Planetary Institute, Houston 2006

Kim, H. I., H. Kim, **L. W. Beegle**, P. V. Johnson, J. L. Beauchamp, and I. Kanik Theoretical Ion Mobility Studies of Amino Acids. Lunar and Planetary Science Conference XXXVII, Abstract #2127, Lunar and Planetary Institute, Houston 2006

Kanik, I. **L. W. Beegle**, S. Kounaves, R. G. Cooks, M. Hecht and P. V. Johnson. Wet Chemistry Experiment at Mars (WetChem) Lunar and Planetary Science Conference XXXVII, Abstract #2154, Lunar and Planetary Institute, Houston 2006

Schmidt, T.J. **L.W. Beegle**, M.G. Wilson, and G.R. Wilson, A concept for the 2016 Mars Astrobiology Field Laboratory. Lunar and Planetary Science Conference XXXVII, Abstract #2337, Lunar and Planetary Institute, Houston 2006

Mungas, G.S., K.R. Johnson, M.J. Pelletier, C.A. Sepulveda, J. Feldman, C. Lebow, J.E. Boynton, M. Deans, B. Pain, **L. W. Beegle**. Raman/CHAMP- Camera, Handlens, microscope probe with integrated Raman laser probe, Lunar and Planetary Science Conference XXXVII, Abstract #2451, Lunar and Planetary Institute, Houston 2006

Johnson, P.V., K. Tang, L.W. Beegle and R.D. Smyth, Laser Ablation-Electrodynamical Ion Funnel for In Situ Mass Spectroscopy on Mars, Lunar and Planetary Science Conference XXXVII, Abstract #2451, Lunar and Planetary Institute, Houston 2006

Carsey, F. D., **L. W. Beegle**, R. Nakagawa, J. O. Elliott, J. B. Matthews, M. L. Coleman, M. H. Hecht, A. B. Ivanov, J. W. Head, Sarah Milkovich, D. A. Paige, A. N. Hock, D. I. Poston, M. Fensin, R. J. Lipinski, and T. M. Schreiner, Palmer Quest: A Feasible and Valuable Vision Mission to the Mars Polar Caps. Lunar and Planetary Science Conference XXXVI, Abstract #1844, Lunar and Planetary Institute, Houston 2005

Wilson, G.R., J.M. Andringa, L.W. Beegle, J.F. Jordan, G.S. Mungus, D. Mulliere, J. Vozoff, and T.J. Wilson. Mars Surface Mobility: Comparison of Past, Present and Future Rover Systems. Lunar and Planetary Science Conference XXXVI, Abstract #2219, Lunar and Planetary Institute, Houston 2005

Mungas, G.S., **L.W. Beegle**, J. Boynton, C.A. Sepulveda, T.A. Fisher, M.A. Balzer, H.R. Sobel, M. Deans, P. Lee CHAMP – Camera, Handlens, And Microscope Probe. Lunar and Planetary Science Conference XXXVI, Abstract #2045, Lunar and Planetary Institute, Houston 2005

Kanik, I., **L. W. Beegle** et. al. A Quantitative Analysis of Extraction of Organic Molecules from Terrestrial Sedimentary Deposit. AGU Fall meeting abstracts, 2004.

Beegle, **L.W.,** et al. Camera, Hand lens, And Microscope Probe (CHAMP): An Instrument Proposed for the 2009 MSL Rover Mission. AGU Fall meeting abstracts, 2004.

Armstrong, J. C. **L. W. Beegle**, and G. Gonzalez. The Lunar Astrobiology Sample Return Mission: Searching for planetary material on the Moon. International Journal of Astrobiology, Supplement 19, 2004

Beegle, **L. W.** W. Abbey, A. Tsapin, H. I. Kim, I. Kanik, B. C. Laughlin and R. G. Cooks[2]
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