

SETH D. HUMPHRIES

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Education

PhD in Engineering, Electrical Engineering Option, September 2008

Montana State University, Bozeman, MT

- Dissertation: Carbon Dioxide Sequestration Monitoring and Verification Via Laser Based Detection System in the 2 μ m Band.
- GPA: 3.85

MS in Electrical Engineering, December 2005

Utah State University, Logan, UT

- Thesis: Calibration and Results of the EQUIS II Plasma Impedance Probe (PIP)
- GPA: 3.63*

BS in Electrical Engineering, December 2005

Utah State University, Logan, UT

- Minors: Computer Science & Spanish
- GPA: 3.63 (Undergraduate total)*

BS in Mathematics, December 2005

Utah State University, Logan, UT

- GPA: 3.63 (Undergraduate total)*

* Graduate and undergraduate GPAs calculated separately

Related Experience

Product Development Scientist

Apogee Instruments, Logan, UT; December 2010–December 2011

- Conceived, designed and field tested new instrument prototypes; new products such as temperature shield and quantum sensor based on miniature spectrometer.
- Designed and led workers installing large, outdoor test facility allowing rapid testing of prototypes.
- Programmed building heating, ventilation and air conditioning (HVAC) system, fused data from multiple sources and programmed web user interface/visualization.
- Performed accelerated aging tests and analysis.
- Improved design of UV sensor and spectral response of Pyranometers.
- Led project to convert sensors with analog output to digital output.
- Represent company at large scientific conferences such as **AGU** and **NCERA**.

Post-Doctoral Researcher

Los Alamos National Laboratory Chemistry Division, Physical Chemistry and Spectroscopy Group, Los Alamos, NM; December 2008–Jan 2011

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- Built unique laser-based instruments, including eye-safe LIDAR, for measurements, in rugged environments, of the abundance ratio of stable isotopes $^{13}\text{CO}_2$ to $^{12}\text{CO}_2$.
- Took instrumentation to various remote locations, setting up instruments and weather stations.
- Built automated GUI, using LabView, for non-expert users to control instrumentation, gather data from multiple sources, perform data fusion and analysis, and display accurate results.
- Performed remote LIBS (Laser-Induced Break-Down Spectroscopy) experiments and complex data analysis, including pre-flight data capture, multivariate statistical analysis (PLS and PCA) for ChemCam verification.
- Focused laser into and through high temperature, high pressure, supercritical CO₂ for Venus SAGE lander.
- Gathered initial data for grant proposal over coming challenges of measuring water-ice at lunar equivalent vacuum pressure.
- Collaborated in ZERT group with scientists from more than eleven institutions.
- Presented data (poster and oral) at many conferences such as LPSC and AGU.

Graduate Research Assistant

Montana State Univ. Electrical and Computer Engineering Department,
Bozeman, MT; August 2005–November 2008

- Built and performed field measurements with unique tunable-laser absorption spectroscopy instrument designed to measure CO₂ in the atmosphere above a hay field.
- Characterized beam shape and quality of 2 μm laser.
- Created stand-alone GUI, using MatLab, to control laser instrumentation, process signal returns and display intuitive results.
- Successfully distinguished released CO₂ plume from large, natural and diurnal variations in hay field.
- Presented data (poster and oral) at conferences such as AGU and Carbon Capture and Sequestration.

Graduate Research Assistant

Utah State Univ. Electrical and Computer Engineering Department, Logan, UT

- Calibrated plasma impedance probe (PIP) for EQUIS II rocket flights to investigate ionospheric plasma bubbles.
- Calibration error to within less than 5% values from independent instruments on same payload.

Undergraduate Research Assistant

USU Plant, Soils and Climate Department, Logan, UT

- Developed, built and calibrated soil-water-content-measurement instruments such as Time Domain Reflectometry (TDR) probes.
- Developed software package (GUI) to display TDR waves, convert them to frequency, perform analysis and graph results.

- Created software wrapper, MatLab, to interface with and graph results from [ATLC](#).
- Developed, built and performed fluid movement experiments in [zero and 2x gravitational environments](#) for [space-plant-growth studies](#).
- Developed analysis algorithms for [WinTDR](#).

Selected Refereed Publications

Jeremie Albert Francois Lasue, Roger C. Wiens, Samuel M. Clegg, Dave T. Vaniman, Katherine Joy, **Seth Humphries**, Alissa Mezzacappa, Nouredine Melikechi, Rhonda McInroy, Stephen Bender. [Remote laser induced breakdown spectroscopy \(LIBS\) for lunar exploration](#). *J. Geophys. Res.*, in press, Oct 2011. doi:10.1029/2011JE003898

Ryan B. Anderson, Richard V. Morris, Samuel M. Clegg, James F. Bell III, Roger C. Wiens, **Seth D. Humphries**, Stanley A. Mertzman, Trevor G. Graff, Rhonda McInroy. [The influence of multivariate analysis methods and target grain size on the accuracy of remote quantitative chemical analysis of rocks using laser induced breakdown spectroscopy](#). *Icarus*, 215(2):608–627, Oct 2011. doi:10.1016/j.icarus.2011.07.034

J. Mark Blonquist Jr., David A. Robinson, **Seth D. Humphries**, Scott B. Jones. [Improved dielectric and electrical conductivity anisotropy measurements using TDR in unsaturated mica](#). *Vadose Zone Journal*, 10(3):1097–1104, Aug 2011. doi:10.2136/vzj2010.0148

Jamie L. Barr, **Seth D. Humphries**, Amin R. Nehrir, Kevin S. Repasky, Laura M. Dobeck, John L. Carlsten, Lee H. Spangler. [Laser-based carbon dioxide monitoring instrument testing during a 30-day controlled underground carbon release field experiment](#). *International Journal of Greenhouse Gas Control*, 5(1):138–145, Jan 2011. doi:10.1016/j.ijggc.2010.03.00

Nina L. Lanza, Roger C. Wiens, Samuel M. Clegg, Ann M. Ollila, **Seth D. Humphries**, Horton E. Newsom, James E. Barefield, the ChemCam Team. [Calibrating the ChemCam laser-induced breakdown spectroscopy instrument for carbonate minerals on Mars](#). *Applied Optics*, 49(13):C211–C217, May 2010. doi:10.1364/AO.49.00C211

Seth D. Humphries, Amin R. Nehrir, Charlie J. Keith, Kevin S. Repasky, Laura M. Dobeck, John L. Carlsten, Lee H. Spangler. [Testing carbon sequestration site monitor instruments using a controlled carbon dioxide release facility](#). *Applied Optics*, 47(4):548–555, Feb 2008. doi:10.1364/AO.47.000548

Kevin S. Repasky, **Seth D. Humphries**, John L. Carlsten. [Differential absorption measurements of carbon dioxide using a temperature tunable distributed feedback diode laser](#). *Review of Scientific Instruments*, 77(11):113107, Nov 2006. doi:10.1063/1.2370746

Selected Presentations

Seth D. Humphries, Amin R. Nehrir, Kevin S. Repasky, John L. Carlsten, Lee H. Spangler, Laura M. Dobeck. Laser-based instruments using differential absorption detection for above and below ground monitoring of carbon dioxide. *EOS Transactions AGU, Fall Meeting Supplement, Abstract U44A-08*, 89(53), Dec 2008. San Francisco, CA

Seth D. Humphries, Amin R. Nehrir, Charlie J. Keith, Kevin S. Repasky, Laura M. Dobeck, John L. Carlsten, Lee H. Spangler. [Differential laser absorption instrument performance at a controlled carbon dioxide release facility](#). Optical Technology & Engineering Conference, Bozeman, MT (invited), Sep 2007

Seth D. Humphries, Kevin S. Repasky, Joseph A. Shaw, John L. Carlsten, Lee H. Spangler. Laser-based differential absorption carbon dioxide sensor. *5th Annual conference on Carbon Capture & Sequestration*, May 2006. Washington D.C

Selected Posters

Seth D. Humphries, Jonathan M. Tucker, Rhonda E. McInroy, Stephen J. Obrey, Roger C. Wiens, M. Darby Dyar, Samuel M. Clegg. [A LIBS elemental emission library for ChemCam at 7 m](#). *6th International Conference on LIBS*, Sep 2010. Memphis, TN

Seth D. Humphries, Julianna E. Fessenden, Laura M. Dobeck, Lee H. Spangler, Samuel M. Clegg. Stable carbon isotope detection for geologic sequestration monitoring. *9th Annual Conference on Carbon Capture & Sequestration*, May 2010. Pittsburgh, PA

Seth D. Humphries, Jonathan M. Tucker, Rhonda E. McInroy, Stephen J. Obrey, Roger C. Wiens, M. Darby Dyar, Samuel M. Clegg. [A LIBS Elemental Emission Library for Chem-Cam at 7 m](#). *41st LPSC*, 2096, Mar 2010. The Woodlands, TX

Seth D. Humphries, Samuel M. Clegg, Julianna E. Fessenden, Laura M. Dobeck, Lee H. Spangler. Remote detection of carbon stable isotope of CO₂ for carbon sequestration. *EOS Transactions AGU, Fall Meeting Supplement, Abstract H21E-0894*, 90(52), Dec 2009. San Francisco, CA

Seth D. Humphries, Amin R. Nehrir, Kevin S. Repasky, John L. Carlsten, Lee H. Spangler, Laura M. Dobeck. Differential absorption measurements of carbon dioxide for carbon sequestration site monitoring using a temperature tunable diode laser. *7th Annual Conference on Carbon Capture & Sequestration*, May 2008. Pittsburgh, PA

Selected Service

[Thesis/Dissertation Template](#)

- Built, actively maintain and webhost style guide (template), using L^AT_EX, to build graduate student theses or dissertations.
- Style guide adheres to strict guidelines required at Montana State University.

Boy Scouts of America Cub Master

- July 2009 – November 2010
- Organize achievement records and ensure scouts receive proper recognition for accomplishments.
- Plan activities for scouts including monthly Pack Meetings.
- Coordinate recruitment and training of adult leaders and volunteers.

Graduate Student Representative on MSU Graduate Council

- October 2006 – April 2008
- Graduate student representative on council of faculty members.
- Served on Policies Subcommittee.

Boy Scouts of America Unit Commissioner

- April 2006 – June 2008
- Assist scouting units (Cub Pack, Scout Troop, Varsity Team and Venturing Crew) of one chartered organization.
- Coordinate recruitment and training of adult leaders for all units.
- Organize advancement records and train new leaders.

Tau Beta Pi, Engineering Honors Society, Montana Alpha Chapter

- September 2006 – May 2008. Acting adviser to undergraduate chapter officers.
- September 2005 – August 2006. Assistant to adviser to undergraduate chapter officers.

SPIE Student Chapter: "hv"

- April 2007 – April 2008, Chapter President.
- October 2006 – April 2007, Chapter Vice President and one of the founding members.
- Coordinate chapter activities such as tours of local industry labs and large chapter recruiting barbecue parties.
- Grew chapter by 170%.

Selected Honors and Accomplishments

Ju-Henji Goshin Karate - Green Belt

Published several news articles. One of which was about the Curiosity Mars rover, November 2011. See <http://www.ksl.com/?nid=968&sid=18124321>

LANL "On the Spot Award" for "Working beyond the call of duty." September 2009

Federal Communications Commission Amateur Radio Operator

- General Class License Holder, call sign **KE7SJR**.

Zero-Gravity Researcher

- Designed, built and flew equipment to monitor fluid movement through porous media in **microgravity conditions**.

- Flew on a combined total of nine sets of 40 **parabolos** equivalent to nearly 2 orbits on the International Space Station

Tri-Lingual

- Fluent in English, Spanish and working knowledge of **Quichua, indigenous language of Otavalo, Imbabura, Ecuador.**

Valedictorian, 1995, Tooele High School, Tooele, UT

Eagle Scout in Boy Scouts of America