

# SETH D. HUMPHRIES

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## Work Experience

### **Product Development Scientist**

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

- Learn new concepts such as physics related plant growth for customer interface and product development.
- Improved design of UV sensor and spectral response of Pyranometers.
- 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*

- Build unique laser-based instruments for both remote (including LIDAR) and in situ field measurements of the abundance ratio of stable isotopes  $^{13}\text{CO}_2$  to  $^{12}\text{CO}_2$ . Fuse data with collocated meteorological data.
- Build intuitive user interface (GUI using LabView) for non-expert users.
- Perform Remote LIBS (Laser-Induced Break-Down Spectroscopy) experiments and complex data analysis, including pre-flight data capture, multivariate statistical analysis (PLS and PCA) for verification of ChemCam, Curiosity.
- Gather initial data for grant proposal over coming challenges of measuring water-ice at lunar equivalent vacuum pressure.
- Collaborate in ZERT group with scientists from many institutions.
- Present 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*

- Build and perform field measurements with unique tunable-laser absorption-spectroscopy instrument designed to measure  $\text{CO}_2$ .
- Create stand-alone and intuitive GUI, using MatLab, for non-expert users to operate and control laser instrumentation.
- Successfully distinguished released  $\text{CO}_2$  plume from natural variations.
- Present data in poster and oral forms.

### **Graduate Research Assistant**

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

- Calibrate plasma impedance probe (PIP) for EQUIS II rocket flights to investigate ionospheric plasma bubbles.
- Calibration with less error than 5% of expected theoretical values.
- June 2004–August 2005

### **Undergraduate Research Assistant**

*USU Plant, Soils and Climate Department, Logan, UT*

- Develop, build and calibrate soil-water-content-measurement instruments such as Time Domain Reflectometry (TDR) probes.
- Develop, build and perform fluid movement experiments in zero and 2x gravitational environments for space-plant-growth studies.
- Complex data analysis with tools such as MatLab.
- December 2000–October 2004

## 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  $\mu$ 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

## 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**, Kevin S. Repasky, Jamie L. Barr, John L. Carlsten. Carbon dioxide detection using a laser based instrument. *Optical Technology & Engineering Conference*, Bozeman, MT (invited), Aug 2008

**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 ChemCam 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 CO<sub>2</sub> for carbon sequestration. *EOS Transactions AGU, Fall Meeting Supplement, Abstract H21E-0894*, 90(52), Dec 2009. San Francisco, CA

**Seth D. Humphries**, Samuel M. Clegg, Julianna E. Fessenden. Remote stable isotope detection of geologic sequestration seepage. *8th Annual Conference on Carbon Capture & Sequestration*, May 2009. Pittsburgh, PA

**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

### **Graduate Student Representative on MSU Graduate Council**

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

- Nominated by the Dean of College of Engineering.

#### **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.
- Coordinated recruitment and training of adult leaders for all units.
- Organize advancement records and train new leader.

#### **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: "hν"**

- 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**

Published news article about the Curiosity Mars rover at <http://www.ksl.com/> November 2011

**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 parabolas in February 2003, June 2003, and February 2004.

#### **Active Member of Tau Beta Pi Since 2002**

#### **Tri-Lingual**

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

**Outstanding Pre-Professional Student of the Year, 1995-1996**  
**Utah State University, Dept. ETE, Logan, UT**

**Valedictorian, 1995, Tooele High School, Tooele, UT**

**Eagle Scout in Boy Scouts of America**