

REYNOLD E. SILBER

Department of Geology & Geophysics ▪ Yale University ▪ New Haven ▪ CT ▪ 06520
reynold.silber@uwo.ca ▪ reynold.silber@yale.edu

Education

- Jan 2014 – Dec 2018 PhD. in Geophysics, Western University, London, ON, Canada
Thesis Title: *Electrical Resistivity of Nickel, Iron and Iron-Silicate Alloy Melts at High Pressure with Implications for the Thermal Conductivity of the Earth's Core*
- Dec 2013 MSc. in Physics, Western University, London, ON, Canada
Thesis Title: *Potential for Measurement of Mesospheric Ozone Density from Overdense Meteor Trains with a Monostatic Meteor Radar*, <http://ir.lib.uwo.ca/etd/1789/>
- Aug 2011 MSc. in Geophysics and Planetary Science, Western University, London, ON, Canada
Thesis Title: *Viscosity of Sulfur at 4.5 GPa and in the L and L' Liquid Regions*
- Apr 2009 Honors BSc. in Geology, Western University, London, ON, Canada

Certifications

- 2016 WHMIS - Workplace Hazardous Materials Information System, Western University
2014 Laboratory Safety & Hazardous Waste Management, Western University
2014 Worker Health and Safety Awareness Training, Western University
2009 The Certificate in University Teaching and Learning, Western University
2009 The Teaching Assistant Training Program Certificate, Western University

Awards and Scholarships

- 2017 The Geophysics Travel Scholarship, Western University
2017 Robert and Ruth Lumsden Graduate Awards in Science, Western, Western University
2014 - Present Western Graduate Teaching Assistantship, Western University
2009 - Present Western Graduate Research Scholarship, Western University
2012-13 Western Graduate Thesis Research Award, Western University
2011-12 Western Graduate Thesis Research Award, Western University
2011-12 Northern Scientific Training Program Award, Indian and Northern Affairs Canada
2011-13 Integrating Atmospheric Chemistry and Physics from Earth to Space (IACPES) NSERC CREATE Scholarship (issuing institution: York University)
2009-13 Western Graduate Teaching Assistantship, Western University
2009-10 Faculty of Science Teaching Assistant Award of Excellence, Western University
2009-10 Nominated for the SOGS Teaching Assistant Award, Western University
2009-10 Western Graduate Thesis Research Award, Western University
2009-10 Faculty of Science Entrance Scholarship, Western University

Academic and Professional Accomplishments and Service

- Invited talk on Phase Transitions, Undergraduate Physics Seminar, Western University (2012)
- Invited Lecture on Phase Transitions, Physics 4930A, Statistical Mechanics (2011)
- GTA Union Social Justice/Political Action Committee (2011-12)

- Invited Lecture on Effective Literature Search for Graduate Students, Earth Science Department (2010)
- GTA Union Departmental Steward (2009-10)
- Society of Graduate Students (SOGS) Councillor (2009-10)
- GTA Union TA Needs & Bursaries (TANB) Committee (2009)
- Best Logo Design (Undergraduate Physics Conference) (2007)
- Science Olympics at Western (2009)
- MST12 Conference, Driver for conference guests (2009)
- Space Society of London, Departmental Representative (2008-09)
- Faculty of Science Telephone Campaign (2008)
- Participated and assisted in the Ozone Sonde Launch Campaign (2008)
- Provided IT support at the Undergraduate Physics Conference (2007)

Originality and Innovation

High Pressure and Temperature Physics

- First successful high pressure electrical resistivity measurements on liquid Ni and liquid Fe (one paper published in JGR-Solid Earth and selected as the editor's highlight, the second paper published in Nature Scientific Reports).
- Developed a technique to contain liquid metal geometry during high pressure and temperature electrical resistivity measurements on transition metals, which is the first successful technique of its kind.
- Developed an internal high-pressure cell design to mitigate and slow down onset of diffusion and contamination between liquid transition metals and thermocouple wires.
- Developed a novel method for the evaluation of viscosity far above the melting curve in the high pressure and temperature region using a cubic anvil press, MSc. Thesis
- Discovered three new high pressure and temperature phases of sulfur, MSc. Thesis
- Discovered previously unknown polymerization of sulfur at 4.5 GPa and above 1000K, MSc. Thesis
- Proposed the existence of previously unknown lambda transition in high pressure and temperature sulfur, MSc. Thesis (published as Silber*, R. E., Secco, R. E. (2012) Viscosity of liquid sulfur at 4.5 GPa in the L and L' regions, High Pressure Research: An International Journal, 32 (4), 451-456)
- Developed a new method for using large volume boron-nitride containers in a high-pressure cell, MSc. Thesis
- Developed an in-house method for producing platinum spheres with perfect sphericity and definite size, High Pressure Physics Lab at Western

Atmospheric Physics

- Discovered an indirect role of ozone in the early electron removal from overdense meteor trains.
- Developed fundamentals of a new technique whereby radar detectable hyperthermal chemistry of overdense meteor trains can be utilized to determine ozone concentration in the atmosphere above 80 km altitude (under extended validation study)

Other

- Proposed a new hypothesis for the role of impact generated shock wave in deposition and emplacement of 'suevites' (Honours Thesis, Western University)

Research Experience

Postdoctoral Associate, *Department of Geology and Geophysics, Yale University* (2018 – Present)

Conducting research in the area of high pressure physics; designing and carrying out laboratory experiments; fabricating and machining sample and cell parts using a variety of tools; performing microscopic analysis; writing technical reports and scientific papers in peer reviewed journals; presenting and disseminating new research results at national and international conferences.

Graduate Research Assistant, *Earth Sciences Department, Western University* (2014 – 2018)

Conducted research in the area of high pressure physics; designed and carried out laboratory experiments on liquid metals; fabricated and machined sample and cell parts using a variety of tools; performed microscopic analysis; wrote technical reports and scientific papers in peer reviewed journals; presented and disseminated new research results at national and international conferences; used various computer applications (MATLAB, Origin, MS Office); mentored incoming students.

Graduate Research Assistant, *Department of Physics and Astronomy, Western University* (2011 – 2013)

Conducted research in the area of atmospheric, radar and meteor physics; developing a new algorithm to describe the concentration and distribution of ozone in the upper atmosphere, and ozone interaction with meteor trails; literature review and compilation; programming using Matlab.

Graduate Research Assistant, *Department of Earth Sciences, Western University* (2009 – 2011)

Conducted research in the area of high pressure physics; designed and carried out a number of laboratory experiments using a sophisticated high pressure and temperature press; performed full sample fabrication and machining; completely redesigned a pressure cell and developed a new and novel method of measuring viscosity of liquids at high pressure and temperature using a cubic anvil press; utilized physical measurements, microscopy, spectroscopy, computer generated results, programming (MATLAB) and plotting (SigmaPlot, Origin, CoPlot).

Research Assistant, *Department of Earth Sciences, Western University* (Summer 2009)

Assisted with day-to-day operations in the High Pressure Lab; conducted a literature review; gave presentations; analyzed research results; operated high pressure equipment; carried out full sample fabrication and machining; gathered data; used various computer applications; microscopic analysis of samples.

Fieldwork Experience

- Spent three weeks conducting fieldwork related to meteor radar installation in Resolute Bay, Nunavut (2012)

Teaching Experience

Graduate Teaching Assistant, Western University (2009 – 2017)

Prepared and marked assignments and exams; was responsible for updating and administrating the course OWL pages; held tutorials and office hours; planned and proctored exams; interacted with students and professors; offered assistance to students; solved problems; made sure lab equipment is in working order; met tight deadlines.

Courses taught:

Earth Science: ES 1086F (2009), ES 1081A/B (2010-11), ES 1023/2023A/B (2014-17), ES 3321A/B (2014-17), ES 2240F (2016)

Physics: First Year Physics Labs (2011-12), Physics 2810B (2011-12)

Astronomy: Astronomy 1021 (2011-12)

Professional Development and Workshops (Selected)

Project Management, Publishing and Grants

- MITACS Project Management I (2014)
- Communicating with Journal Editors (2010)
- Writing for Publication and Getting Published (2010)
- Scholarship Made Easier: Best Practices for Writing and Publishing More Effectively and Efficiently (2009)

Teaching

- ‘I Rest My Case’: Implementing Case Studies in Science and Engineering (2009)
- Flipping Problem Solving On Its Head: New Problem Sets To Enhancing Learning & Motivation (2009)
- Millennials Rising: Students of the New Century (2009)
- “Demo”graphy: Demonstrations as Effective Teaching Tools in the Science & Engineering Classroom (2009)
- The Lights Still Bright in the Rear-view Mirror (September 2, 2009)
- Using the National Survey of Student Engagement to Enhance Student Academic Success (2009)
- Fostering Active Learning in the Classroom (2009)

Short Courses

- IACPES Summer School in Atmospheric Chemistry & Physics, York University (2013)
- IACPES Summer School in Atmospheric Chemistry & Physics, York University (2012)
- Wind Profiler Radar Workshop, Environment Canada (2011)
- Introduction to Uses of High Energy Synchrotron Radiation in Materials and Life Sciences, Department of Chemistry, Western University (2009)

Peer Reviewed Journal Articles

- Silber, R. E., Secco, R. A., Yong, W. and Littleton, J. (2018) *Electrical resistivity of liquid Fe to 12 GPa: Implications for heat flow in cores of terrestrial bodies*, Nature Scientific Reports, 8, 10758, doi: 10.1038/s41598-018-28921-w [[pdf](#)]
- Silber, E. A., Niculescu, M. L., Butka, P., Silber, R. E. (2018) *Nitric oxide production by centimetre sized meteoroids and the role of linear and nonlinear processes in the shock bound flow fields*,

Atmosphere, Linear to Non-Linear Flows in Atmospheric Processes Special Issue, 9(5), 202, 1-21, doi: 10.3390/atmos9050202 [pdf]

- Silber, R. E., Secco, R. A. and Yong, W. (2017) *Electrical Resistivity Measurements of Solid and Liquid Ni up to 9 GPa*, JGR-Solid Earth, 122, doi:10.1002/2017JB014259
- Silber, E. A., Hocking, W. K., Niculescu, M. L., Gritsevich, M., Silber, R. E. (2017) *On Shock Waves and the Role of Hyperthermal Chemistry in the Early Diffusion of Overdense Meteor Trails*, MNRAS, 469(2), 1869-1882, doi: 10.1093/mnras/stx923 [pdf]
- Hocking, W. K., Silber, R. E., Plane, J., Feng, W., & Garbanzo-Salas, M. (2016) *Decay times of transitionally dense specularly reflecting meteor trails and potential chemical impact on trail lifetimes*, Annales Geophysicae, 34(12), 1119-1144, doi: 10.5194/angeo-34-1119-2016 [pdf]
- Secco, R., Silber*, R. E. (2016) *Indoor Micro-Gravity Survey*, The Physics Teacher, 54(4), 213-215, doi: 10.1119/1.4944359 [pdf]
- Silber*, R. E., Secco, R. E. (2012) *Viscosity of liquid sulfur at 4.5 GPa in the L and L' regions*, High Pressure Research: An International Journal, 32 (4), 451-456, doi: 10.1080/08957959.2012.742892 [pdf]

Non-Refereed Articles

- Silber, E. A., Hocking, W. K., Silber, R. E. (2018) *Shock waves generated by overdense meteors in the mesosphere lower thermosphere*, International Meteor Conference Proceedings, Petnica, Serbia, 21-24 September, 2017
- Silber*, R. E. (2016) Northwest Africa 10998 meteorite classification, Officially approved and published by Meteoritical Bulletin Database, 105
- Silber*, R. E. (2013) *Potential for Measurement of Mesospheric Ozone Density from Overdense Meteor Trails with a Monostatic Meteor Radar*, Electronic Thesis and Dissertation Repository, Paper 1789, <http://ir.lib.uwo.ca/etd/1789>, [pdf]
- Silber*, R. E. (2011) *Viscosity of Sulfur at 4.5 GPa and in the L and L' Liquid Regions*, MSc Thesis, The School of Graduate and Postdoctoral Studies, Western University, pp. 144
- Silber, R. E. (2010) *The Geodynamo: Origin of Earth's Magnetic Field*, Western Graduate Geoscience Reviews, Western University
- Silber, R. E. (2009) *Petrography and geochemistry of suevites from the Popigai Impact structure (Russia)*, Undergraduate Honours Thesis, Earth Science Department, Western University, pp. 102

Talks and Presentations

- Silber, R. E., Secco, R., Yong, W., Littleton, J. (2018) *Electrical Resistivity of Solid and Liquid Fe_{4.5}wt%Si at 3-9 GPa*, AGU Fall Meeting, Washington, DC, 10 – 14 December, 2018
- Yong, W., Littleton, J., Secco, R., Silber, R. E. (2018) *Electrical Resistivity of Solid and Liquid Fe at 14 - 24 GPa*, AGU Fall Meeting, Washington, DC, 10 – 14 December, 2018

- Silber, E. A., Gritsevich, M., **Silber, R. E.**, Butka, P. (2018) *The production of nitric oxide by centimetre-sized meteoroids in the upper atmosphere*, European Planetary Science Congress 2018, Berlin, Germany, September 16 – 21, 2018, abstract #582.
- Silber, E. A., Gritsevich, M., **Silber, R. E.** (2018) *Nitric oxide production by centimeter-sized meteoroids impacting the Earth's atmosphere*, 81st Annual Meeting of The Meteoritical Society, Moscow, Russia, July 22-27, 2018, abstract #6183.
- **Silber, R. E.**, Secco, R., Ezenwa, I., Yong, W., Littleton, J. (2017) *Fe, Co, Ni: Electrical Resistivity Along their Melting Boundaries*, AGU Fall Meeting, New Orleans, Louisiana, USA, 10-15 December, 2017, abstract # 218453
- Silber, E. A., **Silber, R. E.**, Hocking, W. K. (2017) *Shock waves generated by overdense meteors in the mesosphere lower thermosphere*, International Meteor Conference, Petnica, Serbia, 21-24 September, 2017
- Secco, R., **Silber, R. E.**, Ezenwa, I., Yong, W., Littleton, J. (2017) *Electrical Resistivity of Fe, Co and Ni along their melting boundaries*, 55th EHPRG Meeting, Poznan, Poland, 3 – 8 September, 2017
- **Silber, R. E.**, Hocking, W. K., Silber, E. A., Gritsevich, M., Niculescu, M. L. (2017) *Detection and Characterization of Meteor Shockwaves Using Radar Observed Meteor Head Echo/Height Correlation*, 32nd URSI GASS, 19-26 August 2017, Montreal, Quebec, Canada
- Hocking, W. K., **Silber, R. E.** (2017) *Radio-wave scattering by meteors and the dependence on meteor trail structure*, 32nd URSI GASS, 19-26 August 2017, Montreal, Quebec, Canada (invited talk)
- **Silber, R. E.**, Silber, E. A., Gritsevich, M. (2017), *On detection of shockwaves generated by overdense meteors*, The 80th Annual Meeting of the Meteoritical Society, 23-28 July, 2017, Santa Fe, New Mexico, USA, abstract #6256
- **Silber, R. E.**, Silber, E. A., Gritsevich, M., Niculescu, M. L., Hocking, W. K. (2017), *On the mechanism of early rapid removal of electrons from postadiabatically expanding overdense meteor trains*, The 80th Annual Meeting of the Meteoritical Society, 23-28 July, 2017, Santa Fe, New Mexico, USA, abstract # 6317
- Moreno-Ibáñez, M., Gritsevich, M., Lyytinen, E., Silber, E. A., **Silber, R. E.**, Trigo-Rodríguez, J. M. (2017) *Revised masses for the Canadian meteor network fireballs*, The 80th Annual Meeting of the Meteoritical Society, 23-28 July, 2017, Santa Fe, New Mexico, USA, abstract # 6318
- Hocking, W.K., **Silber, R. E.**, Silber, E. A. (2017) *Impact of Ozone and Oxygen on Early Stage Decay of Transitionally- and Over-dense Meteor Trails*, The 15th International Workshop on Technical and Scientific Aspects of MST Radar and the 18th EISCAT International Symposium (MST15/iMST2/EISCAT18), held in The National Institute of Polar Research (NIPR), May 26-31, 2017, Tachikawa, Tokyo, Japan, paper M7-8
- **Silber, R. E.**, Secco, R. A. and Yong, W. (2017) *Electrical Resistivity of Molten Ni at High Pressures and Comparison with Preliminary Results on Liquid Fe*, CAP Congress, May 28 - June 2, 2017, Kingston, ON, Canada, abstract #1591
- **Silber, R. E.**, Hocking, W. K., Silber, E. A., Gritsevich, M. (2017) *On the Possibility of Constraining Bright Meteor Shock Wave Forming Altitudes – Theoretical Consideration of Relationship to Radar Observed Meteor Head Echo Termination Heights in MLT*, CAP Congress, May 28 - June 2, 2017, Kingston, ON, Canada, abstract #1578

- **Silber, R. E.**, Secco, R. A. and Yong, W. (2017) *Electrical Resistivity of Molten Ni at High Pressures*, Fallona Interdisciplinary Showcase, Western University, January 16, 2017
- Gritsevich, M., Silber, E. A., Lyytinen, E., Moreno-Ibáñez, M., Trigo-Rodríguez, J. M., Muinonen, K., Penttila, A., **Silber, R. E.** (2017) *A New Approach to Estimate Meteoroid Impact Hazard Based on Atmospheric Trajectory Analysis*, LPSC 48, held March 20–24, 2017, The Woodlands, TX, USA, abstract 2471
- **Silber, R. E.**, Secco, R. A. and Yong, W. (2016) *Electrical Resistivity of Molten Ni at High Pressures*, AGU Fall Meeting, 12-16 December 2016, San Francisco, USA
- Secco, R. A., Ezenwa, I. C., **Silber, R. E.**, Littleton, J. A. H. and Yong W. (2016) *Is Electrical Resistivity Constant on the Pressure Dependent Melting Boundary?*, The 54th European High Pressure Research Group (EHPRG) International Meeting on High Pressure Science and Technology, 4 – 9 September 2016, Bayreuth, Germany
- Secco, R. A., Ezenwa, I. C., **Silber, R. E.**, Littleton, J. A. H. and Yong W. (2016) *Resistivity of Liquid Transition Metals on the Pressure-Dependent Melting Boundary*, 2016 COMPRES Annual Meeting, 19 – 23 June 2016, New Mexico, USA
- Hocking, W. K., **Silber, R. E.** (2015) *Measurement of Mesospheric Ozone Using Meteor Decay Times*, CAP Congress, Edmonton, AB, June 15-19, 2015 (invited talk)
- **Silber, R. E.** and Hocking, W. K. (2014) *The Hyperthermal Chemistry Regime in overdense meteors and relation to ozone density*, MST14 Workshop, INPE-São José dos Campos/SP, Brazil, May 25-31, 2014 (talk)
- **Silber, R. E.** and Hocking, W. K. (2014) *Measurements of mesospheric ozone density using overdense meteor data*, MST14 Workshop, INPE-São José dos Campos/SP, Brazil, May 25-31, 2014
- **Silber, R. E.** and Hocking, W. K. (2013) *Mesospheric Ozone Determination from the Radar Meteor Echo Duration*, IACPES Symposium, York University, Toronto, Jun 10-14, 2013
- **Silber, R. E.** and Hocking, W. K. (2013) *Mesospheric Ozone Determination from the Radar Meteor Echo Duration*, DASP Conference, Kingston, Feb 17-20, 2013
- Secco, R. A., **Silber, R. E.** (2012) *Viscosity of liquid sulfur at 4.5 GPa in the L and L' regions*, 50th EHPRG Meeting, Sep 16-21, 2012, Thessaloniki, Greece
- **Silber, R. E.** (2012) *Study of Overdense Meteors and the Secondary Ozone Layer Using VHF Meteor Radars*, IACPES Symposium, York University, Toronto, Aug 10, 2012
- Osinski, G.R., **Silber, R. E.**, Grieve, R.A.F. (2010) *"Suevites" of the Popigai Impact Structure, Russia: (Mis)understood?*, 41st LPSC, Mar 1-5, 2010, The Woodlands, Texas, 1533, p.2171
- **Silber R. E.** and Osinski G. R. (2009) *Origin of suevites at the Popigai impact structure, Russia* (abstract #GA32B-03), Eos, Transactions, AGU, 90(22), Joint Assembly Supplement, Toronto, On, May 27, 2009
- **Silber, R. E.** (2008) *Reflection on the formation of the Moon – Is the consensus reached too early?*, Western University
- **Silber, R. E.** (2008) *Lunar Mining Prospects*, Western University
- **Silber, R. E.**, J. Fars and A. Durbano (2008) *Acid Mine Drainage: Theory, Impacts and Solutions*, Western University
- **Silber, R. E.** (2007) *The influence of politics on the science in the United States of America: Observations from the Great Canyon*, The Undergraduate Physics Conference, Western University

Professional Associations

- American Geophysical Union
- Canadian Association of Physicists