DAVID A. MACALUSO

Department of Physics and Astronomy
University of Montana
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PROFESSIONAL EXPERIENCE

Associate Professor of Physics, **University of Montana** 2012 − present

Postdoctoral Research Associate, **JILA - University of Colorado, Boulder** 2010 − 2012

Doctoral Fellow In-Residence, **The ALS, Lawrence Berkeley National Laboratory** 2008 − 2010

EDUCATION

Ph. D., Experimental Atomic Physics, **University of Nevada** 2010
Advisor: Dr. Ronald A. Phaneuf
Dissertation:
Photoionization of Se Ions for the Determination of Elemental Abundances in Astrophysical Nebulae

BA Physics, **California Polytechnic State University** 2002

BS Architectural Engineering, **California Polytechnic State University** 1995

TEACHING EXPERIENCE

Associate Professor, University of Montana 2012 − present

PHSX 205N, *College Physics I*, fall 2013, 2015, 2016, 2017 spring 2015
PHSX 206N, *College Physics I Laboratory*, fall 2014, spring 2017
PHSX 322, *Electronics for Scientists*, fall 2012
PHSX 327, *Optics*, spring 2016, 2018
PHSX 330, *Communicating Physics*, spring 2014, 2016, 2018
PHSX 343, *Modern Physics*, fall 2012, 2013, 2014, 2015, 2016, 2017
PHSX 444, *Advanced Physics Laboratory*, spring 2014
MTSI 512, *Graduate Kinetics & Phase Transformations*, spring 2015, 2017

Lecturer, University of Nevada 2008 − 2011

PHSY 151A, *General Physics Lecture I*
PHSY 180, *Physics for Scientists and Engineers I*
PHSY 181, *Physics for Scientists and Engineers II*
PHSY 400, *Energy & Society*
PHSY 721, *Graduate Quantum Mechanics Theory I*
AST 109, *Planetary Astronomy*

Supervisor and Head Tutor, Mathematics Tutoring Center, University of Nevada 2006 − 2008

Tutored all levels of university mathematics and sciences
Supervised 15 undergraduate tutors serving a diverse student population

Graduate Teaching Assistant, University of Nevada 2005
PHSY 151LA, *General Physics Laboratory I*
PHSY 180L, *Physics for Scientists and Engineers Laboratory I*
PHSY 181L, *Physics for Scientists and Engineers Laboratory II*

High School Teacher, Willow Glen High School, San Jose CA 2003 - 2005
Advanced Placement Physics, General Physics, and Physics for English Language Learners
Physiology

Middle School Teacher, Bret Harte Middle School, San Jose CA 1996 - 2000
6, 7, and 8 Grade Mathematics
Advanced Placement Algebra and Geometry
Life Science

GRANT HISTORY

University of Montana Center for Environmental Health Sciences, PI 2015-2016
$74,742
Cytotoxicity of Gold Nanoparticles and Gold Endohedral Fullerenes

National Science Foundation, Co-PI 2014 - 2018
$320,399
Expanding the Atomic Database for Nebular and Stellar Neutron-Capture Element Abundance Determinations

NASA EPSCoR Research Initiation Grant, P.I. 2013-2014
$49,964
Photoionization of Neutron-Capture Atomic Ions for the Determination of Elemental Abundances in Planetary Nebulae

University of Montana Research Initiation Grant, P.I. 2012
$5,000
Scanning Photoionization Microscopy Study of Gold Metallofullerenes

NASA EPSCoR Student Participation Grant, P.I. 2012
$2,000
Photoionization of Neutron-Capture Atomic Ions for the Determination of Elemental Abundances in Planetary Nebulae

The Advanced Light Source (LBNL) Doctoral Fellowship In-Residence 2008 - 2009
$30,000
Development of Techniques for In-Situ Synthesis of Endohedral Fullerene Ions

Robert N. Noyce Foundation Science Teacher Preparation Grant 2005
$10,000

COMMITTEE APPOINTMENTS AND PROFESSIONAL ACTIVITIES

Member, Ph.D. Committee, MSU Materials Science student Saranyan Ragunath	2017
Member, Ph.D. Committee for MSU Materials Science student Tino Woodburn	2015 - present
Member, Ph.D. Committee for UM Chemistry student Sanaa Alabbad	2015 - present
Member, Master's Committee for UM Interdisciplinary Science student Kristian Stipe	2015 - present
Member, The America Physical Society	2005 - present
University of Montana Professional Education Council	2012 - present
Montana University System Materials Science Ph.D. Program Member	2012 - present
Montana State University Materials Science Faculty Hiring Committee	2014
Faculty Mentor, Regional High School Job Shadow Program	2012 - present
Faculty Advisor, UM Women in Physics Club	2015 - present

RESEARCH STUDENTS MENTORED

Allison Mueller	Chantanelle Nava	Kyren Bogolub	Zach Divilbiss
Jared Betz	James Finlay	Colin Hambling	Kenny Harwood
Levi Kindred	Dylan Gross	Madison Drake	Andrea Johnson
Maggie Boyd	Shane Cronin	Carter Webber	Daniel Rogers

PEER-REVIEWED JOURNAL PUBLICATIONS

Cross sections for photoionization of fullerene molecular ions C_n^+ with n = 40, 50, 60, 76, 78, and 84
C. M. Thomas, K. K. Baral, N. B. Aryal, M. Habibi, **D. A. Esteves-Macaluso**, A. L. D. Kilcoyne, A. Aguilar, A.S. Schlachter, S. Schippers, A. Müller, and R. A. Phaneuf, *Phys. Rev. A* **95**, 053412 (2017).

Absolute single photoionization cross-sections of Rb^{2+}: Experiment and theory, **D. Macaluso**, K. Bogolub, A. Johnson, A. Aguilar, A. L. D. Kilcoyne, M. Bautista, A. Kerlin, and N.C Sterling, *J. Phys. B: At. Mol. Opt. Phys.* **49**, 23, 235002 (2016).

Photoionization and photofragmentation of the C_{60}^+ molecular ion
K. K. Baral, N. B. Aryal, **D. A. Esteves-Macaluso**, C. M. Thomas, J. Hellhund, R. Lomsadze, A. L. D. Kilcoyne, A. Müller, S. Schippers, and R. A. Phaneuf, *Phys. Rev. A* **93**, 033401 (2016).

Absolute single-photoionization cross sections of Se^{2+}: Experiment and theory
D. Macaluso, R. A. Phaneuf, A. L. D. Kilcoyne, A. Aguilar, R. Bilodeau, E. Red, N.C. Sterling, B.M. McLaughlin, *Phys. Rev. A.* **92**, 063424 (2015).

Valence-shell single photoionization of Ag-like Xe^{7+} ions: experiment and theory
A. Müller, S. Schippers, **D. Esteves-Macaluso**, M. Habibi, A. Aguilar, A. L. D. Kilcoyne, R. A. Phaneuf, C. P. Balance, and B. M. McLaughlin, *J. Phys. B: At. Mol. Opt. Phys.* **47** 215202 (2014).

Absolute measurements of chlorine Cl^+ cation single photoionization cross section

E.M. Hernández, A.M. Juárez, A.L.D. Kilcoyne, A. Aguilar, L. Hernández, A. Antillón, **D. Macaluso**, A. Morales-Mori, O. González-Magaña, D. Hanstorp, A.M. Covington, V. Davis, D. Calabrese, G. Hinojosa, J. *J. Quant. Spectrosc. Radiat. Transfer*, **151**, 217-223 (2014).

Valence-shell single photoionization of chlorine-like K^{2+} ions: experiment and theory
G. Alna'Washi, M. Lu, M. Habibi, **D. Esteves-Macaluso**, J.C. Wang, R. A. Phaneuf, A. L. D. Kilcoyne, C. Cisneros, B.M. McLaughlin, *Phys. Rev. A*, **90**, 023417 (2014).

Probing confinement resonances by photoionizing Xe inside a C_{60}^{+} molecular cage
R. A. Phaneuf, A. L. D. Kilcoyne, N. B. Aryal, K. K. Baral, **D. A. Esteves-Macaluso**, C. M. Thomas, J. Hellhund, R. Lomsadze, T. W. Gorczyca, C. P. Ballance, S. T. Manson, M. F. Hasoglu, S. Schippers, and A. Müller, *Phys. Rev. A* **88**, 053402 (2013).

Single-photon multiple detachment in fullerene negative ions: absolute ionization cross sections and the role of the extra electron, R. C. Bilodeau, N. D. Gibson, C.W. Walter, **D. A. Esteves-Macaluso**, S. Schippers, A. Müller, R. A. Phaneuf, A. Aguilar, M. Hoener, J. M. Rost, and N. Berrah, *Phys. Rev. Let.***111**, 4, 043003 (2013).

State purity of decelerated beams, N. J. Fitch, M. I. Fabrikant, T. C. Briles, **D. A. Esteves-Macaluso**, Y. Shyur, L. P. Parazzoli, H. J. Lewandowski, *J.Mol.Spec.* **278**, 1-6 (2012).

Absolute photoionization cross-section measurements of Se^{3+} and Se^{5+}, **D. A. Esteves-Macaluso**, A. Aguilar, R. C. Bilodeau, R. A. Phaneuf , A. L. D. Kilcoyne, E. C. Red, N. C. Sterling, *J. Phys. B, At. Mol. Opt. Phys.* **45** 115201 (2012).

Absolute high-resolution Se^{+} photoionization cross-section measurements with Rydberg-series analysis, **D. A. Esteves-Macaluso**, N. C. Sterling, A. L. D. Kilcoyne, R. C. Bilodeau, E. C. Red, R. A. Phaneuf, A. Aguilar, *Phys. Rev. A* **84**, 013406 (2011).

Experimental photoionization cross-section measurements in the ground and metastable state threshold region of Se^{+}, N. C. Sterling , **D. A. Esteves-Macaluso**, A. Aguilar, A. L. D. Kilcoyne, R. C. Bilodeau, E. C. Red, R. A. Phaneuf, *J. Phys. B: At. Mol. Opt. Phys.* **44**, 025701 (2011).

New atomic data for trans-iron elements and their application to abundance determinations in planetary nebulae, N. C. Sterling , M. C. Witthoeft, **D. A. Esteves-Macaluso**, R. C. Bilodeau, A. L. D. Kilcoyne, E. C. Red, R. A. Phaneuf, G. Alna'Washi, A. Aguilar, *Can. J. Phys.* **89**, 4, 379 (2011).

Confinement resonances in photoionization of $Xe@C_{60}$, A. L. D. Kilcoyne, A. Aguilar, A. Müller, S. Schippers, C. Cisneros, G. Alna'Washi, N. B. Aryal, K. K. Baral, **D. A. Esteves-Macaluso**, C. Thomas, R. A. Phaneuf, *Phys. Rev. Let.* **105**, 23, 239901 (2010).

Site-selective ionization and relaxation dynamics in heterogeneous nanosystems, M. Hoener, D. Rolles, A. Aguilar, R. C. Bilodeau, **D. A. Esteves-Macaluso**, P. Olalde Velasco, Z. D. Pešić, E. Red, N. Berrah, *Phys. Rev. A* **81**, 021201 (2010).

Photoionization cross sections for ions of the cerium isonuclear sequence, A. Müller, S. Schippers, R. A. Phaneuf, M. Habibi, **D. A. Esteves-Macaluso**, J. C. Wang, A. L. D. Kilcoyne, A. Aguilar, L. Dunsch, *Phys. Rev. A* **80**, 3, 033407 (2009).

Improved neutron-capture element abundances in planetary nebulae, N. C. Sterling, H. L. Dinerstein, S. Hwang, S. Redfield, A. Aguilar, M. C. Witthoeft, **D. A. Esteves-Macaluso**, A. L. D. Kilcoyne, M. Bautista, R. A. Phaneuf, R. C. Bilodeau, C. P. Ballance, B. McLaughlin, P. H. Norrington, *Publications Of The Astronomical Society Of Australia* **26**, 3, 339-344 (2009).

Significant redistribution of Ce 4d oscillator strength observed in photoionization of endohedral $Ce@C_{82}^{+}$ *ions*, A. Müller, S. Schippers, R. A. Phaneuf, M. Habibi, **D. A. Esteves-Macaluso**, J. C. Wang, A. L. D. Kilcoyne, A. Aguilar, L. Dunsch, *Phys. Rev. Let.* **101**, 13, 133001 (2008).

Photoionization and electron-impact ionization of Ar^{5+}, J. C. Wang, M. Lu, **D. A. Esteves-Macaluso**, M. Habibi, G. Alna'Washi, R. A. Phaneuf, A. L. D. Kilcoyne, *Phys. Rev. A* **75**, 062712 (2007).

Select Conference Proceeding

Photoionization of the endohedral fullerene ions $Sc_3N@C_{80}^{+}$ *and* $Ce@C_{82}^{+}$ *by synchrotron radiation*, A. Müller, S. Schippers, R. A. Phaneuf, M. Habibi, **D. A. Esteves-Macaluso**, J. C. Wang, A. L. D. Kilcoyne, A. Aguilar, S. Yang, L. Dunsch, *Phys. Conf. Ser.* **88**, 02138, (2007).

PRESENTATIONS

Invited Talks

The Ghosts of Dead Stars - A New Era in Laboratory Astrophysics is Born,
Reed College, Portland, OR, November 27, 2017.

Elvis, John Wayne, and Quantum Plasmon Resonances: Where Dead Stars And Engineered Nanomaterials Collide, Harkins Fusion Seminar Series, UM, May 3, 2017.

The Past, Present, and Future of Merged-Beams Science in North America, The Canadian Light Source Seminar Series, Saskatoon, Saskatchewan, CA, September 30, 2016.

Elvis, John Wayne, and Quantum Plasmon Resonances - Where Dead Stars and Engineered Nanomaterials Collide, Idaho State Department of Physics Colloquium Series, Idaho State University, Pocatello, ID, April 11, 2016.

Using optical and biological data to generate a predictive mathematical model of gold nanoparticle toxicity, University of Montana Department of Mathematical Sciences, Applied Math & Statistics Seminar Series, February 23, 2016.

Elvis, John Wayne, and Quantum Plasmon Resonances - Where Dead Stars and Engineered Nanomaterials Collide, Montana State Department of Physics Colloquium Series, Montana State University, Bozeman Montana, November 06, 2015.

Back Off Man, I'm A Scientist, Keynote Address - Annual Montana State Fair, University of Montana, Missoula Montana, March 17, 2015.

Dead Stars, Photonic Nanomaterials, and Plasmon Resonances in Gold and Gold-Endohedral Molecules, Annual MSU Materials Science Faculty Retreat, Fairmont Hot Springs, Anaconda Montana, September 19, 2014.

Dead Stars, Photonic Nanomaterials, and Plasmon Resonances in Gold and Gold-Endohedral Molecules, Guest Seminar Series, Department of Chemistry, University of Montana, Missoula , MT, April 7, 2014.

Endohedral fullerenes and confinement resonances in photoionization of $Xe@C_{60}$, The Advanced Light Source Users' Meeting, Lawrence Berkeley National Laboratory, Berkeley, CA, October 4, 2011.

Carbon molecular traps and their applications in quantum information technology, Guest Seminar Series, The Wineland Research Group, NIST – Time and Frequency Division, Boulder, CO, July 2, 2010.

Advanced Light Source doctoral fellowship research overview: photoionization, fullerenes, and in-situ synthesis of endohedral fullerene complexes, The Lewandowski Research Group, JILA – University of Colorado, Boulder, June 30, 2010.

Photoionization of astrophysically relevant ions and techniques for the in-situ synthesis of endohedral fullerenes, The Advanced Light Source Scientific Support Group Seminar Series, Lawrence Berkeley National Laboratory, Berkeley, CA, April 1, 2010.

Conference Presentations

Compact Surface Plasmon Resonance Biosensor for Fieldwork Environmental Detection, 48th Annual Meeting of The American Physical Society Division of Atomic, Molecular, and Optical Physics conference, Sacramento, CA, June 5-9; *Bull. Am. Phys. Soc.* **62**, 8, BAPS.2015.DAMOP.D1.91, 2017.

Absolute single photoionization cross section measurements of Rb^{2+} and Rb^{3+} ions: experiment and theory, 48th Annual Meeting of The American Physical Society Division of Atomic, Molecular, and Optical Physics conference, Sacramento, CA, June 5-9; *Bull. Am. Phys. Soc.* **62**, 8, BAPS.2015.DAMOP.D1.141, 2017.

Single photoionization cross section measurements of Au^+ ions and first determinations of excited state levels in Au^{2+}, 48th Annual Meeting of The American Physical Society Division of Atomic, Molecular, and Optical Physics conference, Sacramento, CA, June 5-9; *Bull. Am. Phys. Soc.* **62**, 8, BAPS.2015.DAMOP.Q1.160, 2017.

Absolute Photoionization of Br^+ and Rb^{3+} Ions for the Determination of Elemental Abundances in Astrophysical Nebulae, 46th Annual Meeting of The American Physical Society Division of Atomic, Molecular, and Optical Physics conference, Columbus, OH, June 8-12; *Bull. Am. Phys. Soc.* **60**, 7, BAPS.2015.DAMOP.K1.155, 2015.

Photoionization of Au^+, Au^{2+}, and Au^{3+} ions and developments in the synthesis of the metallofullerene $Au@_{60}$, 46th Annual Meeting of The American Physical Society Division of Atomic, Molecular, and

Optical Physics conference, Columbus, OH, June 8-12; *Bull. Am. Phys. Soc.* **60**, 7, BAPS.2015.DAMOP.K1.154, 2015.

Photoionization Cross Sections of P II: Theory & Measurement, 46th Annual Meeting of The American Physical Society Division of Atomic, Molecular, and Optical Physics conference, Columbus, OH, June 8-12; *Bull. Am. Phys. Soc.* **60**, 7, BAPS.2015.DAMOP.T5.8, 2015.

Inner-Shell Photodetachment of the Carbon Anions Chain, 46th Annual Meeting of The American Physical Society Division of Atomic, Molecular, and Optical Physics conference, Columbus, OH, June 8-12; *Bull. Am. Phys. Soc.* **60**, 7, BAPS.2015.DAMOP.K1.140, 2015.

Photoionization of Au^+ ions and developments in the synthesis of the metallofullerene $Au@C_{60}$. 45th Annual Meeting of The American Physical Society Division of Atomic, Molecular, and Optical Physics, Madison, WI, June 4; *Bull. Am. Phys. Soc.* **59**, 8, BAPS.2014.DAMOP.K1.97/101, 2014.

Probing confinement resonances by photoionizing Xe inside a C_{60} molecular cage. 45th Annual Meeting of The American Physical Society Division of Atomic, Molecular, and Optical Physics, Madison, WI, June 4; *Bull. Am. Phys. Soc.* **59**, 8, BAPS.2014.DAMOP.K1.93, 2014.

Photoionization of PII. 45th Annual Meeting of The American Physical Society Division of Atomic, Molecular, and Optical Physics, Madison, WI, June 4; *Bull. Am. Phys. Soc.* **59**, 8, BAPS.2014.DAMOP.K1.132, 2014.

Photoionization of ClII. 45th Annual Meeting of The American Physical Society Division of Atomic, Molecular, and Optical Physics, Madison, WI, June 4; *Bull. Am. Phys. Soc.* **59**, 8, BAPS.2014.DAMOP.K1.133, 2014.

Absolute Photoionization of Rb^+ and Br^{2+} Ions for the Determination of Elemental Abundances in Astrophysical Nebulae. 44th Annual Meeting of The American Physical Society Division of Atomic, Molecular, and Optical Physics, Quebec City, Quebec Canada, June 3-7; *Bull. Am. Phys. Soc.* **58**, 6, BAPS.2014.DAMOP.Q1.141, 2013.

Rotational-state purity of a Stark-decelerated molecular beam, Dynamics of Molecular Collisions, Snowbird, UT, July 10 – 15, 2011.

Photoionization of Xe in a fullerene ion cage, 41st Annual Meeting of The American Physical Society Division of Atomic, Molecular, and Optical Physics, Houston, TX, May 25 – 29; *Bull. Am. Phys. Soc.* **55**, 5 E1 67, 2010.

Absolute single photoionization cross sections of Se^{3+} ions for the determination of elemental abundances in planetary nebulae, 40th Annual Meeting of The American Physical Society Division of Atomic, Molecular, and Optical Physics, Charlottesville, VA, May 19 – 23; *Bull. Am. Phys. Soc.* **54**, 7 C4 10, 2009.

Absolute photoionization of Se^{3+} ions for the determination of elemental abundances in astrophysical nebulae, XXIX International Conference on Phenomena in Ionized Gases, Cancun, Mexico, July 12 – 17; PA1 – 7, 2009.

Absolute photoionization of Se and Xe ions, The Advanced Light Source Users' Meeting, Lawrence Berkeley National Laboratory, Berkeley, CA, October 4 – 6, 2007.

Photoionization of Se^{+} and Se^{2+} ions: experiment and theory, Joint Meeting of The American Physical Society, Division of Atomic, Molecular, and Optical Physics, and the Canadian Association of Physicists, Division of Atomic and Molecular Physics and Photonic Interactions, Calgary, Alberta, Canada, June 6 – 9; *Bull. Am. Phys. Soc.* **52**, 7 R1 65, 2007.

Photoionization and electron-impact ionization of Ar^{5+}, Joint Meeting of The American Physical Society, Division of Atomic, Molecular, and Optical Physics, and the Canadian Association of Physicists, Division of Atomic and Molecular Physics and Photonic Interactions, Calgary, Alberta, Canada, June 6 – 9; *Bull. Am. Phys. Soc.* **52**, 7 D1 59, 2007.