Cady A. Lancaster, Ph.D.

Wood Identification & Screening Center
USFS International Programs
@ Oregon State University
3180 SW Jefferson Street
Richardson Hall 109
Corvallis. OR 97333

Phone (mobile): 541-281-7700
Cady.lancaster@oregonstate.edu//cady.lancaster@usda.gov
www.linkedin.com/pub/cady-lancaster/47/ba/105/

Education

Ph.D., Analytical Chemistry	University of Utah, Salt Lake City, UT	2012-2016
B.S., Chemistry	Southern Oregon University, Ashland, OR *Magna cum Laude* with honors	2008-2012

Current Positions

Oregon State University Assistant Professor, Senior Research	Corvallis, OR	2020 – current
World Forest ID Science Committee		2020

World Forest ID combats illegal logging by collecting geo-referenced wood samples from forests around the world. The collected samples are validated through anatomy and used to generate stable isotope and chemical reference databases for regulatory bodies and law enforcement. As Science Lead, I draft certification and protocols for instrument and analyst admittance to the WFID projects.

U.S. Forest Service International Programs Wood Identification & Screening Center (WISC)	Ashland, OR	2017-current

Founded the Wood Identification & Screening Center on contract of the USFS International Programs. The goal of the Center is to increase global capacity for species identification using DART TOF MS and machine imaging techniques. The Center also processes forensic evidence related to Lacey Act violations for law enforcement. Through reference database building, research, forensic analysis, and international outreach, the Center focuses on minimizing the impact of illegal logging by supporting increased enforcement and education. Additional activities include:

- Project development and oversight of undergraduate research assistants on timber and plant product projects for forensic applications including analytical chemistry methods, techniques, and multivariate data analysis.
- Collection and curation of wood reference samples and spectra for wood identification by DART TOF MS.

Post-Doctoral Research

World Resources Institute and U.S. Fish and Wildlife Services Forensic Laboratory	Mar. 2017-November 2017

Database development for Direct Analysis in Real Time™ Mass Spectrometry (DART-TOF-MS) for screening and forensic identification of wood using chemical profiling or "chemotypes." This international project involved:

- Collaboration with world leading herbaria and xylaria to personally collect over 7000 timber samples for DART wood identification from academic and research institutions.
- Collection of mass spectra using DART-TOF-MS of the timber samples to integrate into the US Fish and Wildlife Forensic Spectra of Trees Database (ForeST Database ©).
- Curated the ForeST Database© to eliminate non-conforming spectra due to mis-ID and poor sample quality (i.e. sapwood).

Graduate Research

University of Utah, Salt Lake City, UT *PI: Dr. Jennifer S. Shumaker-Parry*	Spring 2013 – Fall 2016

Primary dissertation work involved the design, fabrication, synthesis, and characterization of metallic nanoparticles requiring:

- Materials characterization with proficient use of nanoscale microscopies, primarily atomic force microscopy and scanning electron microscopy
- Optical characterization techniques including UV/Vis and FT-IR spectroscopy
- Cleanroom fabrication techniques including electron beam deposition of thin metal films and reactive ion etching processes
- Developed novel substrate uniting synthetic and fabrication approaches to have high enhancement and sensitivity while maintaining controlled geometry

Developed substrates of protected gold nanoparticle systems using atomic layer deposition of alumina for surface enhanced sensing applications.

- This research was motivated by the lack of accounting for the chemical properties of surfaces observed at various optics and engineering conferences

- Advanced thin film deposition for nanoparticle systems by improving the hydrophilicity of gold with oxygen plasma and ultra-violet ozone treatments

Independently oversaw research for interns and undergraduates with responsibilities including:
- Experimental plan and design for short-term and long-term projects with corresponding lab procedures and safety protocols
- Edited posters and presentations for conferences and advised on communication for scientific and general audiences
- Ran weekly sub-group meetings to monitor progress, address research questions in a group format to encourage collaboration, and streamline research goals among sub-group members.

Maintained research projects with nation-wide NSF Chemistry at the Space Time Limit Center for Chemical Innovation
- Developed substrates for specific analysis needs of the center
- Coordinated research projects and timelines with multiple labs
- Participated in NSF site visits, poster sessions, and attended many center led events for research, education, and career development.

As a senior lab member, established lab procedures to increase functionality of instrumentation and new graduate students:
- Implemented standard operating protocol manuals lab-wide and user-generated error reports for all lab instruments
- Oversaw maintenance and purchasing of lab and staff computers.

Other Work Experience and Research

U.S. Fish and Wildlife Services Forensic Laboratory	Ashland, OR	2011-2012

Developed identification techniques using Direct Analysis in Real Time™ Mass Spectrometry (DART-TOF-MS) of *Dalbergia, Aquilaria,* and other trade timber species.
- The first technique to accurately identify endangered species of tree against similar species and is now the flagship chemical identification program for timber in the world.
- Developed statistical profiles of heartwood chemical signals to establish species and geographical origin
- Recruited into the Student Temporary Employee Program after volunteer work.

Assisted in the development of chemical libraries of polymer-tipped bullets
- Used visible spectral comparison, FTIR, and elemental mapping approaches to generate libraries used for statistical identification of polymers

Multicultural Resource Center, Southern Oregon University	Ashland, OR	2008-2012

Office manager 2010-2012, student assistant 2008-2010
- Responsibilities included overseeing the office operations of the center including several staff members, scheduling, and event organizing
- Maintained functionality of center, provided university and center information to incoming students and community members, and assisted in the programming of events

Honors and Awards

2016	Curie Club Outstanding Research Assistant
2014	NSF GRFP Honorable Mention
2013-2015	*Integrative Graduate Education and Research Traineeship (IGERT)* NSF Fellow, University of Utah
2012	Cal Giddings Fellow, University of Utah
2012	Sigma Xi Awardee
2012	Omicron Delta Kappa National Honor Society Awardee
2011-2012	AAUW Outstanding Woman in Chemistry
2012	Student Research Scholarship from the Society for Wildlife Forensic Science
2012	Student Research Scholarship from the American Society of Trace Evidence Examiners
2011	Selected for the Student Educational Employment Program to work NFWFL
2009	Department of Chemistry Alumni/Faculty Scholarship, SOU
2008	Presidential Scholarship, Southern Oregon University

Technical Skills

Direct Analysis in Real Time Time-of-Flight Mass Spectrometry	Reactive ion etching
FT-IR spectroscopy and related measurement modes	Nanosphere template lithography
Scanning electron microscopy	UV-visible spectrophotometry
Focused Ion Beam - scanning electron microscopy	GC-MS
Atomic force microscopy	LC-MS
Electron-beam metal deposition (Ag, Au, Cu, Cr, Al)	Atomic layer deposition
Video Spectral Comparator- Hyperspectral imaging, spectroscopy	Clean Room Settings, procedures

Teaching Experience

| Chemistry 3000 Lab Instructor | University of Utah, Salt Lake City, UT | 2012-2013 |

Instructed advanced students in analytical chemistry and quantitative analysis.

- Coordinated with other teaching assistants to rotate preparation of experiments for all lab sections and advise on possible difficult steps for students
- Oversaw one laboratory session of 9-14 students (1/3 of class) bi-weekly
- Monitored general laboratory safety and on-site trouble-shooting
- Completed all laboratory experiments prior to student labs to troubleshoot potential problems

| Organic Chemistry Mentor | Southern Oregon University, Ashland, OR. | 2010-2011 |

Led weekly sessions of 6-10 students in organic chemistry

Outreach Activities

| Co-organizer of "Dogs and Donuts" | University of Utah, Salt Lake City, UT | 2016 |

- Mental health awareness and outreach program targeted at graduate students. Monthly meetings bring ~70 grad students together for coffee and stress management activities.

| Volunteer Science Fair Judge | Salt Lake County Areas | |

Judge for the elementary division of the Salt Lake Valley Science and Engineering Fair (SLVSEF) and regional fairs.

- *Whittier Elementary School,* Salt Lake City, UT — 2014
- *SLVSEF*, SLC Districts — 2014
- *SLVSEF* State*,* Salt Lake City, UT — 2013-2015

| Science Project Leader | Salt Lake County Areas | |

- *Salt Lake Center for Science Education* — 2013-2016

  Develop and teach lesson plans to high school students in low-income areas. These students then went to neighboring elementary schools in high-risk areas to teach the same science lessons. Lessons include spectroscopy and nanoparticle synthesis.

- *Woodrow Wilson Elementary School* (Refugee school) — May 2015

  Taught lesson on polymer chemistry which included hands-on science experiment with 8-10 year olds. Education coordinator reported spikes in interest for science class.

- *Whittier Elementary School* — June 2013

  Taught section on polymers for a second grade class including hands-on bouncy balls synthesis.

| Group Safety | *Southern Oregon University Outdoor Programs*, Ashland, OR | 2009-2012 |

- Led safety lessons and group activities for white-water and rock climbing to college community.

Active Memberships

American Chemical Society, Society for Wildlife Forensic Science, The International Association of Wood Anatomists, American Society of Mass Spectrometry

Professional Development and Certifications

Wood Anatomy course	Instructor: Peter Gasson (Kew, England)	Feb 2020
Wood Anatomy Course	Instructor: Peter Gasson (Ashland, OR)	Apr 2018
CITES Wood Anatomy Course	Instructor: Mike Wiemann (Miami, FL)	Jan 2018
Codecademy "Pro Intensive SQL"		Aug 2018

Coursera		Jul 2017
"R programming"	Present License 2GA3J2KREPZH	
Hugo Rossi Lecture Series	University of Utah, Salt Lake City, UT	March 2016
"Participation of Women in Science: Problems and Solutions" Workshop with Carol Gross		
• Group problem-solving session to address retention of women in science at different milestones		
American Chemical Society.	UC Irvine, Irvine, CA	January 2014
"Preparing for Life After Graduate School"		

Publications

Gasson, PE, Lancaster, CA, Young, R, et al. WorldForestID: Addressing the need for standardized wood reference collections to support authentication analysis technologies; a way forward for checking the origin and identity of traded timber. Plants, People, Planet. 2020; 00: 1– 12. https://doi.org/10.1002/ppp3.10164

Lancaster, C. A.; Scholl, W. E.; Ticknor, M. A.; Shumaker-Parry, J. S., Uniting Top-Down and Bottom-Up Strategies Using Fabricated Nanostructures as Hosts for Synthesis of Nanomites. The Journal of Physical Chemistry C 2020, 124 (12), 6822-6829.

Maekawa, H.; Drobnyh, E.; Lancaster, C. A.; Large, N.; Schatz, G. C.; Shumaker-Parry, J. S.; Sukharev, M.; Ge, N.-H., Wavelength and Polarization Dependence of Second-Harmonic Responses from Gold Nanocrescent Arrays. The Journal of Physical Chemistry C 2020, 124 (37), 20424-20435.

Deklerck, V.; Lancaster, C.A.; Acker, J.V.; Espinoza, E.O.; Bulcke, J.V.; Beeckman, H. Chemical Fingerprinting of Wood Sampled along a Pith-to-Bark Gradient for Individual Comparison and Provenance Identification. Forests 2020, 11, 107.

Celani CP, Lancaster CA, Jordan JA, Espinoza EO, Booksh KS. Assessing utility of handheld laser induced breakdown spectroscopy as a means of Dalbergia speciation. Analyst 144:5117-5126. 2019.

Schmitz, N. (ed.), Blanc-Jolivet, C., Boner, M., Cervera, M.T., Chavesta, M., Cronn, R., Degen, B., Deklerck, V., Diaz-Sala, C.,Dormontt, E., Ekué, M., Espinoza, E.O., Gasson, P., Gehl, D., Gehre, M., Haag, V., Hermanson, J.C., Honorio-Coronado, E., Koch, G., Lancaster, C., Lens, F., Liendo-Hoyos, E.P., Martínez-Jarquín, S., Montenegro, R., Paredes-Villanueva, K.,Pastore, T., Ramananantoandro, T., Rauber-Coradin, V.T., Ravaomanalina, H., Rees, G., Sebbenn, A.M., Tysklind, N.,Vlam, M., Watkinson, C., Wiemann, M. General sampling guide for timber tracking. Global Timber Tracing Network, GTTN Secretariat, European Forest Institute and Thuenen Institute. 2019.

Lancaster, C. A.; Shumaker-Parry, J. S. Surface Preparation of Gold Nanostructures on Glass by Ultraviolet- Ozone and Oxygen Plasma for Thermal Atomic Layer Deposition of Al2O3. Thin Solid Films, 2016, 612, 141-146.

Espinoza, E. O.; Lancaster, C. A.; Kreitals, N. M.; Hata, M.; Cody, R.; Blanchette, R. A.: Distinguishing Wild from Cultivated Agarwood (Aquilaria spp) Using Direct Analysis in Real Time (DART) and Time-of-Flight Mass Spectrometry. Rapid Commun. Mass Spectrom. 2014, 28, 281-289.

Lancaster, C. A.; Espinoza, E. O. Evaluating agarwood products for 2-(2-phenylethyl)chromones using direct analysis in real time time-of-flight mass spectrometry. Rapid Commun. Mass Spectrom. 2012, 26, 2649-2656.

Lancaster, C. A.; Espinoza, E. O. Analysis of select Dalbergia and Trade Species Using Direct Analysis in Real Time and Time-of-Flight Mass Spectrometry for CITES enforcement. Rapid Commun. Mass Spectrom. 2012, 26, 1147-1156.

Thompson, M.; Lancaster, C.; Banta, M.; Hart, C.; Scanlan, M.; Espinoza, E. The Chemical Properties of Selected Polymer-Tipped bullets. Association of Firearm and Tool Mark Examiners 2011, 33 (1), 38-46.

Instructor (selected)

Wood Identification by DART TOF MS Workshop. National Fish and Wildlife Forensics Laboratory. Ashland, OR. May 2-3, 2019.

Meeting/Workshop Organizer

Meeting Organizer. *Timber Enforcement and Illegal Logging Working Group*. National Fish and Wildlife Forensics Laboratory (Ashland, OR) May 7-8, 2019. Cooperative workshop co-hosted by NFWFL, WRI, and USFS. Brought

together enforcement and technical agencies to share information on technologies and processes used to enforce illegal logging laws including the US Lacey Act and CITES timber enforcement. Participants included special agents, investigators, prosecutors, and specialists from APHIS PPQ, APHIS EIS, USDOJ, CBP, HSI, USFS, and US State Department.

Illegal Logging Working Group. National Fish and Wildlife Forensics Laboratory (Ashland, OR). April 24, 2018.

Presentations

Lancaster, C. A. [Rapid Screening by Fluorescence of Finished Wood Products for Targeted Sampling](#). *International Union of Forest Research Organizations* (IUFRO 2019). Curitiba, Brazil. Oct. 1, 2019

Lancaster, C. A., Edgard, E. O. [Wood Identification by Direct Analysis in Real Time Time-of-Flight Mass Spectrometry.](#) *International Union of Forest Research Organizations* (IUFRO 2019). **Invited Talk, Panelist**. Curitiba, Brazil. Sept 30, 2019.

Parker- Forney, Lancaster, C. A., Edgard, E. O. Moad, A. [Forensic Spectra of Trees Database: Case study for rapid database development](#). *International Union of Forest Research Organizations* (IUFRO 2019). Curitiba, Brazil. Sept 30, 2019.

Lancaster, C. A. Advances in Forensic Identification of Wood Products. **Invited talk/Technology Panelist**. *Timber Regulation Enforcement Exchange*. London, England. March 15, 2019.

Panel Topic: The latest science-based authentication technologies and how these are being used to support enforcement.

Lancaster, C. A. Wood Identification Technologies. Invited talk/Technology Panelist. *Regional training workshop on capacity assessment on wood identification for the trade of CITES-listed priority timber species.* Chetumal, Quintana Roo, Mexico. November 6–8, 2018

Lancaster, C. A. Species Identification at the National Fish and Wildlife Forensics Laboratory. Invited talk/Technology Panelist. Oswaldo Rodriguez Roque Memorial Lecture and Symposium 2018*. Mahogany, Species of Elegance: The History and the Science.* Yale Art Gallery, New Haven, CT. November 2018.

Lancaster, C. A. Wood Identification Challenges. *Plant Inspection Station Tour with Representative Derek Kilmer*. August 8, 2018. Seattle, WA.

Lancaster, C. A. Workshop on combining timber tracking tools & on securing reliable species and origin identification. *Global Timber Trafficking Network*. Workshop participant and invited presenter. Wageningen, Netherlands. June 12-14, 2018

Lancaster, C.A., Espinoza, E. O. "Wood Identification at the US Fish and Wildlife Forensics Laboratory." Invited Talk. Jan. 30- Feb 01, 2018. ID CITES Training Workshop. Miami, FL.

Lancaster, C. A., Hoenig, E. Wood Identification Systems. Invited Talk and Panelist. *2nd National Training Illegal Logging, Land Use, Related Crimes and Financial Investigations*. Hosted by Interpol. Medan, North Sumatra, Indonesia, Nov. 2017.

Lancaster, C. A. Rapid Identification of Botanical Chemotypes by DART-TOFMS*. Invited seminar*. Naturalis Biodiversity Center, Leiden, Netherlands, August 2017.

Lancaster, C. A. Rapid Identification of Botanical Chemotypes by DART-TOFMS. *Invited seminar*. Smithsonian Institute, Washington D.C., USA. June 2017.

Lancaster, C.A.; Maekawa, H. Large, N. ; Cooper, C.T. ; Feng, R.; Schatz, G.C.; Ge, N.-H.; Shumaker-Parry, J.S. 2016. Atomic Layer Deposition on Complex Nanostructured Substrates for Enhanced Non-linear Spectroscopy. Poster Presentation. *NSF Site Visit: CaSTL 2016*. Irvine, CA, April 2016.

Lancaster, C. A.; Shumaker-Parry, J. S . 2016. Nanostructure Surface Preparation for Thin Film Deposition. *Interfacial and Bioanalytical Chemistry Seminar Series*. Salt Lake City, UT, Feb 2016.

Lancaster, C. A.; Shumaker-Parry, J. S. 2015. Probing the localized plasmon decay for nanostructures with complex geometries using atomic layer deposition. Oral Presentation. *Pacifichem 2015*, Honolulu, HI, Dec 2015.

Lancaster, C. A.; Shumaker-Parry, J. S. 2015. Atomic layer deposition on heterogeneous nanostructured substrates. Oral Presentation. *Pacifichem 2015*, Honolulu, HI, Dec 2015.

Lancaster, C. A.; Shumaker-Parry, J. S Fabrication of Robust Nanocrescent Substrates Using Atomic Layer Deposition. Poster Presentation. *NanoTechnology for Defense Conference*, Chantilly, VA, Nov. 2014

Atomic Layer Deposition of Al_2O_3 on Plasmonic Nanostructures for Surface Chemistry and Multiplex Analysis.

Lancaster, C. A.; Liu, A.; Sudbury, C.; Gale, B. K.; Shumaker-Parry, J. S. 2014. Poster Presentation. *Near Field Optics 1*3, Snowbird, UT, Sept. 2014.

Lancaster, C. A.; Liu, A.; Sudbury, C.; Gale, B. K.; Ge, N.-H; Shumaker-Parry, J. S. 2013. Poster Presentation. *NanoUtah,* Salt Lake City, UT, Salt Lake City, UT, 2013.

Lancaster, C. A.; Liu, A.; Sudbury, C.; Gale, B. K.; Shumaker-Parry, J. S. 2014. Protected Nanoparticle Substrates For Multiplex Analysis. Poster Presentation. *Noble Metal Nanoparticles Gordon Conference*, South Hadley, MA, June 2014.

Lancaster, C. A.; Shumaker-Parry, J. S. (2014) Atomic Layer Deposition of Al_2O_3 on Plasmonic Nanostructures. *CaSTL Seminar Series.* Webinar, Feb. 2014.

Lancaster, C.; Aixiang Liu, Nien-Hui Ge, Jennifer Shumaker-Parry. 2013. Atomic Layer Deposition of Al_2O_3 on Plasmonic Nanostructures and Catalytic Activity of Tethered Triphenylphosphine Stabilized Gold Nanoclusters. (Poster Presentation) *Chemistry at the Space Time Limit Site Visit 2013*. May 2013.

Espinoza, E. O.; Baker, B.; Lancaster, C. 2012. Species Identification by Chemical Analysis. Certification Workshop Presenter. *Society for Wildlife Forensic Science Symposium 2012*, Jackson, WY.

Lancaster, C.; Espinoza, E. O.; Doin, V. 2012. Jackson, WY. Analysis of select *Dalbergia* and Trade Species Using Direct Analysis in Real Time and Time-of-Flight Mass Spectrometry for CITES enforcement. (Oral Presentation) *Society for Wildlife Forensic Science Symposium 2012*.

Lancaster, C.A.; Hart, C; Thompson, M. 2012. Elemental Analysis of Select Polymer-Tipped Bullets. (Poster Presentation) *Society for Wildlife Forensic Science Symposium 2012*, Jackson, WY.

Lancaster, C.A.; Hart, C. 2012. Elemental Analysis of Select Polymer-Tipped Bullets. *Southern Oregon Arts and Research 2012*, Southern Oregon University, Ashland, OR.

In Press

Clarke, W. M. Scientists Are Using This Collection of Wood Samples to Combat Illegal Logging. *Smithsonian Mag.* August. 11, 2017. https://www.smithsonianmag.com/smithsonian-institution/scientists-are-using-collection-wood-samples-combat-illegal-logging-180964305/

Brulliard, K. Helping solve the wildest crimes. *The Washington Post.* Aug. 30, 2019., https://www.washingtonpost.com/news/national/wp/2018/08/30/feature/when-the-crime-victim-is-an-animal-this-lab-is-on-the-case/

Irwin, A. Tree sleuths are using DNA tests and machine vision to crack timber crimes. *Nature*. Apr. 3, 2019. https://www.nature.com/articles/d41586-019-01035-7.

GTTN. Building a Future: Lumber Poaching in Oregon and Brazil. Global Timber Trafficking Network. Jul. 4, 2019. https://globaltimbertrackingnetwork.org/2019/07/04/building-a-future-lumber-poaching-in-oregon-and-brazil/

S2 E3: Building a Future – Lumber Poaching in Oregon and Brazil. Earth Focus. Aired: 5/7/2019. https://www.pbssocal.org/programs/earth-focus/building-a-future-lumber-poaching-in-oregon-and-brazil-jxxb7s/