

Christian Colin Per L'Orange

CONTACT INFORMATION

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PROFESSIONAL EXPERIENCE

Volckens Research Team

Research Scholar, Department of Mechanical Engineering & Center for Energy Development and Health, Colorado State University, Fort Collins, Colorado USA **Dec 2014-Present**

Research Scholar, Department of Environmental & Radiological Health Sciences, Colorado State University, Fort Collins, Colorado USA **July 2014-Dec 2014**

Postdoctoral Fellow, Department of Environmental & Radiological Health Sciences, Colorado State University, Fort Collins, Colorado USA **June 2012-July 2014**

Associate Director of the Center for Energy Development and Health and a member of a multidisciplinary team working on a range of air quality and personal exposure research topics including the development of new low-cost techniques of evaluating air pollution and assessing human exposure to pollutants. Responsible for day to day operations of the Powerhouse Energy Campus Aerosol lab. Coordinate the activities of the cookstove sub-team, which consists of 5-10 individuals, as well as designing and managing independent research.

Highlighted Projects:

- NIOSH - Cookstove Air Pollution: Emissions Profiles and Subclinical Effects of Exposure
- EPA - Quantifying the Climate, Air Quality, and Health Benefits of Improved Cookstoves: An Integrated Laboratory, Field, and Modeling Study
- NIOSH - Design, Evaluation, & Validation of a Next-Generation Inhalable Aerosol Sampler
- NIEHS - The Commuter Exposure Study: Linking Exposure, Source-Receptor Models, and Health
- UNF - Protocol Development for Testing Plancha Style Cookstoves and Evaluating Cookstove Durability
- World Bank - Africa Clean Cooking Energy Solutions (ACCES) QA/TS
- American National Standards Institute Technical Expert on ISO Technical Committee 285

Major Achievements:

- Lead designer of a custom controlled exposure facility for human health studies.
- Responsible for coordinating day to day operations of multiple multi-million dollar research projects.
- Project coordinator on EPA funded project characterizing biomass emissions. Work included coordinating field studies in four countries around the world.
- Collaborator on the development of a personal exposure measurement backpack that includes approximately 10 real time measurements logging every 10 seconds for approximately 30 hours. Measurements include GPS, black carbon, particulate matter, acceleration, and carbon monoxide. Responsible for ensuring the robustness of the system and power management.
- Coordinating a multi-week collaborative testing in August of 2014. This event included participants from multiple universities and government laboratories and as well as participants from multiple continents.
- Member of the Technical Advisory Group (TAG) supporting the American National Standards Institute (ANSI) delegation participating in ISO Technical Committee 285. This technical committee is tasked with developing standards for improved biomass cookstoves and clean cooking solutions.
- Member of ACCES technical committee working with the World Bank to develop technical tools and standards for cookstove laboratories, manufacturers, and distributors in Africa.

- Responsible for the design, development, and installation of the Center for Energy Development & Global Health Cookstoves Laboratory. When completed this laboratory will be one of the most sophisticated cookstoves laboratories in the world.
- Principle designer on the development of a low-cost personal sampling pump with a target price of under \$50.
- Principle designer on the development of a low-cost inhalable particulate matter sampler. This sampler has equivalent or superior performance to current samplers available on the market but can be sold at the fraction of the cost of current market leaders.
- Developed and installed a mobile ambient air quality monitoring system.

MiLO Ventures L.L.C.

December 2011-Present

Co-Founder, Fort Collins, Colorado USA

MiLO Ventures is a small technology development company that was founded in 2011. MiLO Ventures specializes in developing one-off technologies and projects for niche markets. Members of the team bring collectively over 17 years of industry experience working for and with companies ranging from small start-up operations to large international organizations. The team has brought together a unique combination of skill sets with education in electrical and mechanical engineering, including advanced graduate degrees. The team has experience in both fundamental research and practical application with a focus on taking concepts to products. The team has experience in developing low-cost prototypes, development of mobile apps, and web-based data management systems.

Advanced Cookstoves Laboratory

August 2006-June 2013

Graduate Researcher, Engines and Energy Conversion Lab, Colorado State University, Fort Collins, Colorado USA

Member of a multidisciplinary team responsible for advancing the fundamental understanding of small scale biomass combustion, in particular combustion efficiency and heat transfer efficiency, and to link that knowledge to the design and evaluation of improved biomass cook stoves. Personal responsibilities included the development of protocols and standards, evaluation of testing results, design and implementation of emissions hoods and measurement systems, and project management of stove development projects.

Envirofit Quality Testing Services - Consultant

July - October 2011

Fort Collins, Colorado USA & Ethiopia

Contracted to act as Envirofit Quality Testing Services' representative for a field project in Ethiopia. Helped the Barr Foundation (project sponsor) define baseline performance of existing technologies, perform customer centered market studies to help identify product needs and gaps, perform monitoring and evaluation, kitchen performance testing (KPT), as well as lab and field performance testing. Sought to help design new stoves and improve existing stoves, while maximizing performance and durability.

**PROFESSIONAL
FIELD EXPERIENCE:**

- *Accra, Ghana, November 2015.* ISO Technical Meeting for the development of biomass cook-stove standards.
- *Kampala, Uganda, June 2015.* U.S. Environmental Protection Agency funded field study characterizing the emissions emitted from biomass cookstoves.
- *La Esperanza, Honduras, February 2015.* U.S. Environmental Protection Agency funded field study characterizing the emissions emitted from biomass cookstoves.
- *Kampala, Uganda; Kinshasa Democratic Republic of the Congo; Dakar, Senegal, April 2014.* World Bank funded technical expert . Visited three regional testing centers in Africa responsible for designing and testing clean cookstoves in Africa. Reviewed current technical capacity and knowledge as well as providing guidance to local teams on how to improve scientific and testing methodologies being used.
- *Phnom Penh, Cambodia, March 2013.* Attended international conference addressing biomass combustion in the developing world. Presented on current efforts to develop standard testing methodologies for the evaluation biomass cookstove durability.

- *Addis Ababa & Tigray, Amhara, Oromia, and SNNP regions, Ethiopia, August 2011.* Conducted a technical review of current cookstove capacities in Ethiopia including product design, testing facilities, and production capacity. The study included visits to 47 producers, 69 government/NGO/bilateral organizations, meetings with 11 focus groups (a total of 115 participants), and the conducting of 15 cookstove performance tests. Testing was conducted both in a local laboratory and in homes.
- *Lima, Peru, Feb 2011.* International conference addressing indoor air pollution in the developing world.
- *Karnataka, India, Jan 2011.* Met with a government representative responsible for product testing and certification. Evaluated durability testing protocol being used by research partner to predict product life and gave feedback for method refinement and improvement. Gathered data on consumer feedback of products currently being used and evaluated durability of designs.
- *Karnataka, India, July 2008.* Responsible for establishing emissions testing facility for research partner, Envirofit International, and gathered user feedback for products currently in the market.

PROFESSIONAL
CERTIFICATIONS

- Project Management Professional certification - The Project Management Professional (PMP) credential scheme is accredited by the American National Standards Institute (ANSI) against the International Organization for Standardization (ISO) 17024. **January 2016 - Present**

EDUCATION

Colorado State University, Fort Collins, Colorado USA

Ph.D., Mechanical Engineering

Summer 2013

- Dissertation: *"The Development of Numerical Tools for Characterizing and Quantifying Biomass Cookstove Impact"*

M.S., Mechanical Engineering

Summer 2009

- Thesis: *"Testing Methodologies for Biomass Cook Stoves and their Effects on Emissions"*

B.S., Mechanical Engineering

Spring 2008

PUBLICATIONS

Good, N., Molter, A., Ackerson, C., Bachard, A., Carpenter, T., Clark, M., Fedak, K., Kayne, A., Koehler, K., Moore, B., **L'Orange, C.**, Quinn, C., Ugave, V., Stuart, A., Peel, J., Volckens, J. (2015). The Fort Collins Commuter Study: Impact of route type and transport mode on personal exposure to multiple air pollutants. *Journal of Exposure Science & Environmental Epidemiology*.

L'Orange, C., Leith, D., Volckens, J., DeFoort, M. (2015) A Quantitative Model of Cookstove Variability and Field Performance: Implications for Sample Size. *Biomass and Bioenergy*

L'Orange, C., Anderson, K., Sleeth, D., Anthony, T., Volckens, J. (2014) Simple, Low-Cost Sampler for Inhalable Aerosol. *Annals of Occupational Hygiene*. *Annals of Occupational Hygiene*

Hawley, B., **L'Orange, C.**, Olsen, B., Marchese, A., Volckens, J. (2014) Oxidative Stress and Aromatic Hydrocarbon Response of Human Bronchial Epithelial Cells Exposed to Petro- or Biodiesel Exhaust Treated with a Diesel Particulate Filter. *Toxicological Sciences*.

Cate, D., Nanthasurasak, P., Riwkulkajorn, P., **L'Orange, C.**, Henry, C., Volckens, J. (2013) Rapid Detection of Transition Metals in Welding Fumes Using Paper-Based Analytical Devices. *Annals of Occupational Hygiene*.

L'Orange, C., DeFoort, M., Volckens, J. (2012) Influence of Stove Type and Cooking Pot Temperature on Particulate Matter Emissions from Biomass Cook Stoves. *Energy for Sustainable Development*

L'Orange, C., DeFoort, M. (2012) Influence of Testing Parameters of Biomass Stove Performance: Evaluation of Testing Methodologies. *Energy for Sustainable Development*.

PATENTS

- Patent number 61/261,694. "Combustion Chamber for Charcoal Cookstoves." Technology #10-048