

Peter A. Lucon, Ph.D., P.E.

ASSISTANT PROFESSOR
DEPARTMENT OF MECHANICAL ENGINEERING
MONTANA TECH OF THE UNIVERSITY OF MONTANA
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EDUCATION & LICENSING

Ph.D., Mechanical Engineering	GPA 3.86/4.0	2013
Montana State University, Bozeman, MT		
Dissertation Title: <i>Resonance: The Science Behind the Art of Sonic Drilling</i>		
Research Advisors: Dr. David Miller and Dr. Douglas Cairns		
Dissertation Link: http://scholarworks.montana.edu/LuconP0513.pdf		
M.S., General Engineering	GPA 4.0/4.0	2004
Montana Tech of The University of Montana, Butte, MT		
Published Paper Title: <i>An Artificial Neural Network Approach to Multiphase Continua Constitutive Modeling</i>		
Research Advisor: Dr. Richard Donovan		
Published Paper Link: http://www.sciencedirect.com/science/article/pii/S1359836807000029		
B.S., Mechanical Engineering	GPA 3.1/4.0	2002
Montana State University, Bozeman, MT		
Professional Engineer		2009–Present
License #: 15543 PE, MT		
Licensed Engineering Intern		2002–2009
License #: 15543 EI, MT		

RESEARCH INTERESTS

- Research, create, and investigate methods to utilize mechanical resonance in novel applications to reduce the overall energy requirements.
- Modeling and verification testing of mechanical resonant systems to evaluate and ensure stability and efficiency.
- Innovate and develop unique Non-Destructive Testing (NDT) techniques based on resonance to enable new methods to detect and quantify material damage, mechanical strain, residual stress, weak bonded joints, voids, manufactured defects, and hidden corrosion.
- Modeling and development of higher efficiency electro-mechanical driver systems to lower the overall cost and energy loss to resonant systems.

RELEVANT EXPERIENCE

Assistant Professor

Jun. 2017–Present

Department of General Engineering, Montana Tech of The University of Montana, Butte, MT

- Teach engineering science, mechanical engineering, and interdisciplinary courses, conduct research relating to mechanical systems with an emphasis on resonant technologies, and while providing services to the department, school, and community.

Director of Technology and Processing

Jan. 2011–Jun. 2017

Resodyn Acoustic Mixers, Butte, MT

- Manage programs and oversee all new technology development for the RAM product platforms. The developed products were second-generation lab mixers including the PCCARAM, PharmaRAM, PharmaRAM II, LabRAM II, and LabRAM II H and the new OmniRAM system that has been developed for 5 kg of batch or for the newly developed continuous mixers for pastes and powders.
- Technical design lead for continuous mixer development for pastes and powders.
- Oversight of all technical and design requirements and sign off and approval on all design packages.
- Full system CAD modeling, design, and drawing packages for commercially released machines and R&D prototypes.
- Perform the complex analytical modeling for RAM and other R&D projects that include FEA, system modeling, control system modeling and system design optimization.
- Interface between the clients and sales team on engineering technical questions, product specifications and technical training.
- Interface between engineering and manufacturing for system level technical decisions and oversight.
- Manage and oversee product line extension development for: LabRAM, LabRAM II, PCCARAM, PharmaRAM, PharmaRAM II, LabRAM II H, RAMbio, and RAM 5 machines.
- Company representative in technical client and vendor interactions at Resodyn headquarters, RAM Technical Interchange and at client locations.

Senior Mechanical Engineer

Jan. 2009– Jun. 2017

Resodyn Corporation, Butte, MT

- Developed and refined the mathematical models for RAM55 and RAMbio products.
- Refined models for NDT sensor technology to detect and quantify hardening of fastener holes for US Navy and commercial applications.
- Principal Investigator on several Phase II SBIR Research projects ranging from acoustic mitigation systems for the U.S. Navy to NDT instruments for evaluating damage in wind turbine blades.
 - SERDP Grant No: WP-2605, Environmentally Conscious Process Development for the Production of Composite Propellants and Explosives, \$900,000.
 - DOD SBIR Phase II Enhancement Grant No: FA9300-11-C-3011, Resonant Acoustic Mixing of Solid Rocket Motor Propellant to Minimize Property Variations, \$500,000.
 - DOD SBIR Phase II Grant No: N00178-09-C-1034, Spray-on Composite System for Low Frequency Acoustic Mitigation, \$500,000.

- DOE SBIR Phase I and II Grant No: DE-FG02-09ER85414, An Advanced Vibrothermography Approach for Wind Turbine Applications, \$1,100,000.
 - Funded \$200,000 for 5 Masters Graduate Students at Montana State University under the Grant No: DE-FG02-09ER85414.
 - Served on 2 Graduate Research Committees at Montana State University under the Grant No: DE-FG02-09ER85414.

Mechanical Engineer

Jan. 2005–Jan. 2009

Resodyn Corporation, Butte, MT

- Co-developed and verified a control scheme to find and track mechanical resonance of the ResonantAcoustic® Mixers.
- Developed lumped parameter mathematical models to characterize degree of mixing for ResonantAcoustic® Mixers.
- Principal Investigator on Phase I & Phase II SBIR Research projects.
 - DOE SBIR Phase I Grant No: DE-FG02-06ER84618, A Heliportable Sonic Drilling Platform for Microhole Drilling and Exploration, \$100,000.
 - NSF SBIR Phase II Grant No: OII-0548753, Powder-Powder Mixing and Powder-Liquid Mixing by a Novel High-Intensity Vibrational Mixer, \$422,987.
- Developed test plans for mixing efficiencies for frequencies from 60 Hz to 150 Hz.
- Developed and performed test plans to verify scalability of ResonantAcoustic® Mixing from laboratory size of 0.5 L to production scales of 210 L.
- Developed a closed form model and control methodology for the sonic drilling process.

Adjunct Professor & Contract Instructor

Jan. 2004 – Dec. 2005

Montana Tech of The University of Montana, Butte, MT

- Instructed Dynamics and Kinematics of Machines (Engr 4570)
- Instructed Mechanics of Materials (Engr 3350)

Graduate Teaching Assistant

Jan. 2004–May 2004

Montana Tech, Butte, MT

- Instructed two sections of Mechanics of Materials (Engr 3350)

Graduate Teaching Assistant

Aug. 2003–Jan. 2004

Montana Tech, Butte, MT

- Instructed Mechanics of Materials Lab (Engr 3360)

Engineering Intern

May 2002–Aug. 2002

Resodyn Corporation (Formerly Montec Research), Butte, MT

- Developed mathematical models to optimize output and efficiency of Resonant Sonic Reactor. Design and analysis efforts resulted in improvement of chassis configuration and overall function.
- Primary designer for Biodiesel project, work involved detailed design of plant layout, component selection, and process flow design. Completed original design and 19 revisions.
- Completed several design projects for heat exchangers, pumps, and simple structures. Conducted vibration analysis to enhance resonating devices and assisted in component procurement based on provided specifications.

Laborer**May 2001–Sept. 2001***Aquatech Inc., Belgrade, MT*

- Assisted service personnel installing, repairing, and fabricating irrigation equipment. Loaded and unloaded freight and stocked inventory.

Resident Advisor**Aug. 1999–May 2001***Montana State University, Bozeman, MT*

- Served as part of a twelve-member team, who were responsible for the overall safety, well-being, and extracurricular education of more than 800 students. Acted as a liaison between Residence Life and my floor of 50+ students. Promoted an atmosphere conducive to studying and open communication. Trained first year Resident Advisors.

Independent Contractor**June 1999–Jan. 2001***Jack of All Trades, Bozeman, MT*

- Assisted and performed multiple plumbing, roofing, framing, finishing, and electrical tasks. Removed snow from a route containing over 35 residences.

PATENTS

1. Patent Application 20160228836A1, Control of Vibratory/Oscillatory Mixers, H.W. Howe, **P.A. Lucon**, J.D. Thornton, and B.J. Seaholm (Filed 2014)
2. Patent Application 20160236162A1, Mechanical Resonant System, **P. Lucon** and B.J. Seaholm (Filed 2014)
3. Patent Application 20130329514A1, Mechanical System that Continuously Processes a Combination of Materials, L.C. Farrar, S.L. Cogui, **P.A. Lucon**, and J. Lucon (Filed 2013)
4. Patent Application 20150146496A1, Mechanical System that Fluidizes, Mixes, Coats, Dries, Combines, Chemically Reacts, and Segregates Materials, **P.A. Lucon** and L.C. Farrar (Filed 2013)
5. Patent Application 20150253266A1, Methods and Systems for Detecting Flaws in an Object, **P.A. Lucon** and L.C. Farrar (Filed 2013)
6. Patent Application 20130181701A1, Nondestructive Inspection Apparatus and Method for Evaluating Cold Working Effectiveness at Fastener Holes, S.L. Galbraith, L.C. Farrar, C.H. Loo, and **P.A. Lucon** (Filed 2011)
7. 9,099,074: Custom Tunable Acoustic Insulation, **P.A. Lucon**, M. Ivosevic, S.L. Cogui, and L.C. Farrar, (Filed 2010, Issued 2015)
8. 8,905,624: Control of Vibratory/Oscillatory Mixers. H.W. Howe, **P.A. Lucon**, J.D. Thornton, and B.J. Seaholm (Filed 2009, Issued 2014)
9. 8,925,648: Automatic Control of Oscillatory Penetration Apparatus, **P.A. Lucon** (Filed 2008, Issued 2015)

PUBLICATIONS

1. **Lucon, P.A.**, 2013, “Resonance: The Science Behind the Art of Sonic Drilling”, Ph.D. Dissertation, Montana State University Scholar Works, 263 p.
2. **Lucon, P.A.**, S.L. Coguill, and Z. R. Martineau, 2012, “Electrostatic Generation and Methods to Mitigate Electrostatic Discharge while using the ResonantAcoustic® Mixer.” IPS Seminar, Denver Colorado, Conference Proceeding.
3. D. Lamberto, **P. Lucon**, D.R. Nyquist, and J.E. Yarrington, 2011, “Investigation of Acoustic Dryer for API Processing”, AIChE Conference, Minneapolis, MN. Conference Proceedings, 120b.
4. A. Vanarase, J.G. Osorio, F.J. Muzzio, S.L. Coguill, and **P. Lucon**, 2010, “ResonantAcoustic® Mixing; Uniform Distribution of Minor Materials During Powder Mixing. JANNAF 36th Propellant and Explosives Development and Characterization Joint Subcommittee Meeting, Orlando FL. https://www.researchgate.net/researcher/2068088141_P_Lucon.
5. **Lucon, P.A.**, J. Yarrington, and L.C. Farrar, 2010, “Low-frequency Acoustic Mixing of Complex and Multiphase Systems”, Conference Proceedings, Mixing XXII, Victoria, BC Canada <http://www.mixing.net/Conferences/mix22/abstracts/Peter%20Lucon.pdf>.
6. W. Lattin, R. Arbon, J. Bickley, and **P. Lucon**, 2010, “Acoustic Mixing and Treatment of Organic Waste: Results of Proof of Principle -10168, WM2010 Conference, Phoenix, AZ., Conference Proceeding. <http://www.wmsym.org/archives/2010/pdfs/10168.pdf>.
7. **Lucon, P.A.**, 2008, “DOE/ER/84618-1 Final Report”, DOE SBIR Phase I Final Technical Report for A Heliportable Sonic Drilling Platform for Microhole Drilling and Exploration. <http://www.osti.gov/scitech/biblio/927796>
8. **Lucon, P.A.**, and Donovan, R.P., 2007, An Artificial Neural Network Approach to Multiphase Continua Constitutive Modeling, Composites Part B: Engineering, v. 38, p. 817–823.
9. **Lucon, P.A.**, Dr. Richard P. Donovan. 2004 “An Artificial Neural Network Approach to Multiphase Composite Constitutive Modeling.” Proceedings of the Eleventh International Conference on Composites/Nano Engineering (ICCE-11), Hilton Head Island, SC.

PRESENTATIONS

1. **Lucon, P.A.**, 2011–2016, Resonate Acoustic Mixing, Presented 4 to 8 Technical Presentations each Year, Resodyn Mixing Forum, August 2011-2016, Butte, Montana. (Full list of presentations provided at the RAM Forum Presentations section).
2. **Lucon, P.A.**, 2016, Continuous Processing of Energetic Materials” Technical Presentation, Presented at The 42nd International Pyrotechnics Society Seminar, July 10–15, Grand Junction, CO.
3. **Lucon, P.A.**, and L.C. Farrar. 2016, Resodyn Acoustic Mixers Energetic Processing Design Features, Technical Presentation, Presented at the 1st Annual RAM Energetic Community RAM Operation and Safety Forum, March, NAWCWD China Lake.

4. **Lucon, P.A.**, and L.C. Farrar, 2016, Environmentally Conscious Process Development for the Production of Composite Propellants and Explosives, SERDP-ESTCP Kick-off Review, Washington, D.C.
5. **Lucon, P.A.**, J. Lucon, S. Coguill, L.C. Farrar, 2015, Continuous Acoustic Mixing, Technical Presentation, TTCP, February, Quebec City, Ontario, Canada.
6. **Lucon, P.A.**, L. C. Farrar, J. Lucon, and S. Coguill, 2014, Continuous Low-Frequency Acoustic Mixing of Pastes and Powders, Technical Presentation, North American Mixing Forum, Mixing XXIV, June 22–27, Lake George, NY.
7. **Lucon, P.A.**, 2014, Continuous Acoustic Mixing for Powdered Metals, Technical Presentation, CPMT (Center for Powder Metal Technology), October, Detroit, MI.
8. **Lucon, P.A.**, and Funkhouser, K., 2014, Resodyn Acoustic Mixer Energetics Applications HazOps Status Brief, Technical Presentation, TTCP, RAM Focus Group, Indian Head, MD.
9. Coguill, S., Lucon, J., **Lucon, P.A.**, and Farrar, L.C., 2014, Cavitation Free Acoustic Environment, 40th International Pyrotechnics Seminar, July 13–18, Colorado Springs, CO (presented by S. L Coguill).
10. **Lucon, P.A.**, Coguill, S. Lucon, J., and Skinner, J.L., 2013, RAM Mixing of Nanomaterials, Nanotechnology for Defense Conference, November 4–7. Tucson, AZ.
11. **Lucon, P.A.**, 2011, Low Frequency Acoustic Mixing, Technical Presentation, IAB Meeting, Rutgers University, November, Piscataway, NJ.
12. Lamberto, D., **Lucon, P.A.**, et al, 2011, Investigation of Acoustic Dryer for API Processing, Presented at AIChE®, October, Minneapolis, MN.
13. Vanarase, A, Osorio, J, Muzzio, F.J., Coguill, S.L., **Lucon, P.A.**, 2010, ResonantAcoustic[®] Mixing; Uniform Distribution of Minor Materials During Powder Mixing, Presented by Scott C. at JANNAF, December, Orlando, FL.
14. **Lucon, P.A.**, 2010, Low Frequency Acoustic Mixing, Presented at Advances in Pharmaceutical Process Design, October 27–29, Bethesda, MD.
15. **Lucon, P.A.**, 2010, Low Frequency Acoustic Mixing of Complex and Multiphase Systems, Presented at North American Mixing Forum, Mixing XXII Conference, June 20–25, Victoria, British Columbia, Canada.
16. Lattin, W., Arbon, R., Bickley, J., and **Lucon, P.A.**, 2010, Acoustic Mixing and Treatment of Organic Waste: Results of Proof of Principle. WM2010 Conference, March 7-11, Phoenix, AZ.
17. **Lucon, P.A.**, and Donovan, R.P., 2004, An Artificial Neural Network Approach to Multiphase Composite Constitutive Modeling, Presented at the Eleventh International Conference on Composites/Nano Engineering (ICCE-11), August 8–14, Hilton Head Island, SC.

POSTERS

1. **Lucon, P.A.**, G.M. Sperry, 2016, Examples of Power Density and Operating Conditions for the ResonantAcoustic[®] Mixer (RAM), The 42nd International Pyrotechnics Society Seminar, July 10–15, Grand Junction, CO.
2. **Lucon, P.A.**, Lucon, J., Coguill, S., and Farrar, L.C., 2014, Application of Low-Frequency Acoustic Mixing as a Continuous Chemical Reactor, North American Mixing Forum, Mixing XXIV, June 22–27, Lake George, NY.
3. **Lucon, P.A.**, and Farrar, L.C., 2014, Universal Batch Mixing Platform, North American Mixing Forum, Mixing XXIV, June 22–27, Lake George, NY.

RAM FORUM PRESENTATIONS

2016, Sixth Annual Technical InterChange, Sept. 20–23, Butte, MT

1. **P. Lucon**, “Success in Using RAM Technology”
2. **P. Lucon**, “Experimental Considerations when Developing Products Using the RAM Technology”
3. **P. Lucon**, G. Sperry, and J. Whaley, “RAM Process Scale-up of Solid Mixing”
4. **P. Lucon** and J. Whaley, “RAM Mixing of Solids”
5. **P. Lucon** and J. Whaley, “RAM Mixing Regimes for Solids”
6. **P. Lucon**, G. Sperry, and J. Whaley “RAM Process Scale-up of Mixing Pastes”
7. **P. Lucon**, G. Sperry, and J. Whaley, “RAM Mixing of Liquids and Pastes”
8. J. Whaley, and **P. Lucon**, “Mixing Regimes for Liquids and Pastes”

2015, Fifth Annual Technical InterChange, Aug. 4–6, Butte, MT

9. **P. Lucon**, “Effective Energy Transfer”
10. **P. Lucon**, “Mixing Regimes for Liquids and Pastes”
11. **P. Lucon**, “Experimental Considerations when developing products using RAM Technology”
12. **P. Lucon**, “RAM Mixing of Solids”
13. **P. Lucon**, “RAM Scaling of Mixing Liquids and Pastes”
14. **P. Lucon**, “RAM Mixing of Liquids and Pastes”

2014, Innovations & Breakthroughs in ResonantAcoustic[®] Industrial Mixing, Aug. 19–22, 2014

15. **P. Lucon**, “Experimental Considerations when Developing Products using RAM Technology”
16. **P. Lucon**, “Scaling RAM Technology Considerations and Strategies”
17. **P. Lucon**, “RAM Mixing Regimes”
18. **P. Lucon**, “Mixing Solid – Solid Materials”
19. **P. Lucon**, “Mixing Pastes and Viscous Materials”
20. **P. Lucon**, “RAM Mixing Principles”

2013, Advances & Outcomes in ResonantAcoustic[®] Industrial Mixing, Aug. 13–16, 2013, Butte, MT

21. **P. Lucon**, “Solid – Solid Scaling”
 22. S. Coguill, Z. Martineau, **P. Lucon**, “Static Considerations”
 23. S. Coguill, Z. Martineau, and **P. Lucon**, “Vacuum and Heating and Cooling Considerations”
 24. **P. Lucon**, “Experimental Considerations when Developing Products using RAM Technology”
 25. **P. Lucon** and S. Coguill, “RAM Mixing Scaling for Liquid Systems Background, Considerations and Strategies”
 26. **P. Lucon**, “RAM Mixing Regimes,
 27. **P. Lucon**, “RAM Mixing Principles and Theory”
- 2012, The Art and Technology of ResonantAcoustic® Industrial Mixing, Aug. 21–24, Butte, MT*
28. **P. Lucon**, “RAM Mixing Regimes and Effective Energy Transfer”
 29. **P. Lucon**, “Experimental Considerations when Developing Products using RAM Technology”
 30. **P. Lucon** and S Coguill, “RAM Mixing Scaling Background and Considerations and Strategies”
 31. **P. Lucon**, S. Coguill and J. Thornton, “Vacuum, Heating and Cooling, and Static Considerations”
 32. **P. Lucon** and S. Coguill, “Mixing Pastes and Viscous Materials Mixing Background and Considerations”
 33. **P. Lucon** and S. Coguill, “Solid – Mixing Background and Considerations”
 34. **P. Lucon**, “RAM Mixing Principles and Theory”
- 2011, RAM Energetics Conference, July 14–15, Butte, MT*
35. **P. Lucon**, “ResonantAcoustic® Mixing Principals and Analysis”

ACQUIRED FUNDING

- Grant No: WP-2605, Environmentally Conscious Process Development for the Production of Composite Propellants and Explosives, \$900,000, 2016–2019.
- DOD SBIR Phase II Enhancement Grant No: FA9300-11-C-3011, Resonant Acoustic Mixing of Solid Rocket Motor Propellant to Minimize Property Variations: \$500,000, 2016–2017.
- DOD SBIR Phase II Grant No: N00178-09-C-1034, Spray-on Composite System for Low Frequency Acoustic Mitigation, \$500,000, 2008–2011.
- DOE SBIR Phase I and II Grant No: DE-FG02-09ER85414, An Advanced Vibrothermography Approach for Wind Turbine Applications, \$1,100,000, 2009–2012.
- NSF SBIR Phase II Grant No: OII-0548753, Powder-Powder Mixing and Powder-Liquid Mixing by a Novel High-Intensity Vibrational Mixer. \$422,987, 2006–2007.
- DOE SBIR Phase I Grant No: DE-FG02-06ER84618, A Heliportable Sonic Drilling Platform for Microhole Drilling and Exploration \$100,000, 2007.

STUDENTS MENTORED

Triston Firth	Montana Tech, Butte, Mechanical Engineering Intern Product Development and Research Mentor	2016-Present
Dallas Brieze	Montana Tech, Butte, Mechanical Engineering Intern Product Development Mentor	2016
Matthew Sparboe	Montana Tech, Butte, Technical Sales Intern Technical Mentor	2015
Chris Kinsey	Montana Tech, Butte, Mechanical Engineering Intern Product Development Mentor	2015-2016
Fabio Rocha	Montana Tech, Butte, General Engineering Intern Research Mentor	2014
Angelina Anderson	Montana Tech, Butte, General Engineering Intern Research Mentor under Grant No: DE-FG02-09ER85414	2013
Rick Ladouceur	Montana Tech, Butte, General Engineering Intern Research Mentor under Grant No: DE-FG02-09ER85414	2013
Matt Peterson	Montana State University, Bozeman, Mechanical Engineering PhD Research Mentor under Grant No: DE-FG02-09ER85414	2012-2013
Mark Allen	Montana Tech, Butte, Technical Sales / Marketing Intern Technical Mentor under Grant No: DE-FG02-09ER85414	2012
Trey Riddle	Montana State University, Bozeman, Mechanical Engineering PhD Research Mentor under Grant No: DE-FG02-09ER85414	2011-2012
Corey Cook	Montana State University, Bozeman, Mechanical Engineering MS Thesis Committee under Grant No: DE-FG02-09ER85414	2011-2012
Darren Platt	Montana State University, Bozeman, Mechanical Engineering MS Research Thesis Mentor under Grant No: DE-FG02-09ER85414	2011
Anthony Trudnowski	Montana State University, Bozeman, Mechanical Engineering MS Research Thesis Mentor under Grant No: DE-FG02-09ER85414	2011
Zach Martineau	Montana Tech, Butte, General Engineering Intern Product Development and Research Mentor under Grant No: N00178-09-C-1034	2009-2010
Anthony Trudnowski	Montana Tech, Butte, General Engineering Intern Research Mentor under Grant No: OII-0548753	2008
Jared Hobeck	Montana Tech, Butte, General Engineering Intern Research Mentor under Grant No: OII-0548753	2007-2008
John Constantine	Montana Tech, Butte. General Engineering Intern Research Mentor under Grant No: OII-0548753	2006

Joe Enterline	Montana State University Bozeman, Mechanical Engineering Intern Research Mentor	2006
Trevor Tollesfbol	Montana State University, Bozeman, Mechanical Engineering Intern Research Mentor	2006

HONORS, AWARDS, & SERVICE

- Member, Audi Club of North America (2010–Present).
- Member, SAE International (2008–2013).
- Member, The American Society for NonDestructive Testing (2007–2013).
- Member, Tau Beta Pi (2004–Present).
- Member, International Neural Networks Society (2004–2015).
- Proctored the Fundamentals of Engineering Exam (Spring and Fall 2004).
- Chief Justice for the Judicial System at Montana Tech (2003–2004).
- Served as Secretary for American Society of Mechanical Engineers at Montana State University Chapter (2001–2002).
- Representative for Collegiate 4-H on the State 4-H Leaders Council (1999–2001).
- Nominated for Resident Advisor of the Year at Montana State University; Recognized for Quality Developmental Programming for the Residence Hall (1999–2000).