Kyle Horne

Ph.D.

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Work History

2016-Present **Assistant Professor**, *University of Wisconsin Platteville*, Platteville, WI.
Currently teach the thermal/fluids lab, computational methods, and environmental control design. Research topics include uncertainty quantification of particle-image velocimetry calculations, rheological model fitting, and assistance with aspects of the NASA Starshade project.

2014-2016 **Assistant Professor**, *University of North Texas*, Denton, TX.
Taught the fluid dynamics and computational fluid dynamics courses for the Mechanical and Energy Engineering Department, as well as mentored senior design students and a topic of special problems. Research focused on thermal transport at all scales, from molecular dynamics simulations up to computational fluid dynamics, as well as uncertainty quantification for both experiments and simulations.

Spring 2014 **Graduate Teaching Assistant**, *Utah State University*, Logan, UT.
Assisted in the instruction of students in algorithm implementation and theoretical foundation. Developed supplemental course materials and assisted during labs.

2013 **Chateaubriand Fellow**, *Ecole Centrale de Paris*, Châtenay-Malabry, France.
In a collaboration between Utah State University and Ecole Centrale de Paris under the guidance of Sebastian Volz, molecular dynamics calculations (Lammps) were used to simulate a quantum cascade laser super-lattice to compute its thermal conductivity and phonon dispersion relations. Photo-thermal radiometry was used to verify the results of the simulations.

2010-2014 **Graduate Research Assistant**, *Utah State University*, Logan, UT.
Initially working on the uncertainty analysis of an oscillating-vessel viscometer, focus moved into photo-thermal methods; spent a month working with Andreas Mandelis and his CADIFT lab on site at the University of Toronto. Most research covered photo-thermal measurement methods' uncertainty analysis and atomic-force microscopy.

Fall 2011 **Graduate Teaching Assistant**, *Utah State University*, Logan, UT.
Assisted in the instruction of students in advanced performance analysis including cache optimization and vector processing. Given full responsibility for the final section of the class covering parallel processing for computer clusters through message passing.

Fall 2010 **Instructor**, *Utah State University*, Logan, UT.
Taught the undergraduate programing class in mechanical engineering curriculum with one teaching assistant and one grader. The class covered fundamental Fortran 95+ programing concepts and skills, and consisted of approximately 120 students.

2009 **Private Engineering Consultant**, *Black Box Engineering Inc.*, Logan, UT.
As a consulting project for a local engineering company while attending school, the process of running finite element analysis for stress computation in flanges of various configurations was automated through a graphical interface which would interpolate between cached pre-computed solutions to provide quick estimates of the maximum stress in a particular flange design.

2007–2009 **Graduate Research Assistant**, *Utah State University*, Logan, UT.
Worked on various projects, including a multi-objective genetic algorithm optimization of cross-dock problems using the Dakota toolkit and the pcgns library. Attended *Supercomputing* three times and competed in the SC09 *Storage Challenge*, after having been selected as one of five finalists which included competing teams from NVIDIA, Microsoft and IBM.

Education

2014 **Doctor of Philosophy, Mechanical Engineering**, *Utah State University*, Logan, UT.
Focus on photothermal methods for property measurement and molecular dynamics

2009 **Master of Science, Mechanical Engineering**, *Utah State University*, Logan, UT.
Focus on fluids, heat transfer and computational methods

2009 **Bachelor of Science, Mechanical Engineering**, *Utah State University*, Logan, UT.
Emphasis on computational engineering

Doctoral Dissertation

Title Nano-scale thermal property prediction by molecular dynamics simulation with experimental validation

Supervisor Heng Ban

Description The Tersoff potential in LAMMPS was used to simulate the thermal properties of various III-V semiconductors to validate the coefficients for use in the prediction of a quantum cascade laser diode's properties. The results compare favorably with experimental values from the literature and initial photothermal radiometry experiments also conducted for the dissertation.

Master's Thesis

Title Parallelization of Performance Limiting Routines in the Computational Fluid Dynamics General Notation System Library

Supervisor Thomas Hauser

Description A parallel implementation of key routines in the cgns library was written for use on computer clusters using MPI as the interconnect library interface. The performance of the library was tested in various data configurations using Panasas parallel storage.

Professional Development

August 2019 **Mini NETI-I**, *American Society of Engineering Educators*, Platteville, WI.
A slightly-shortened version of the full NETI-I workshop, this event introduces the fundamentals of modern pedagogy including learning objectives, active learning techniques, appropriate assessment strategies, backwards course design, and some applications thereof.

June 2019 **Faculty College**, *University of Wisconsin System*, Richland Center, WI.
The annual UW-System faculty college is an opportunity for instructors from across disciplines and institutions to come together and improve as instructors, mentors, and peers.

January 2019 **KEEN: ICE**, *KEEN: The Kern Family Foundation*, Dallas, TX.
The ICE workshop includes an abbreviated introduction to modern pedagogy, and then expands on these foundations with entrepreneurial-minded learning. Key concepts are the three C's (curiosity, connections, and create-value), mind-set in addition to learning objectives, and expanded design/problem solving methods to embrace the larger context of engineering work and wider ramifications of design choices.

May 2018 **Mini ExCEEd**, *American Society of Civil Engineers*, Platteville, WI.
The Mini-ExCEEd Teaching Workshop is a day and a half condensed version of the full ExCEEd Teaching Workshop. The Mini-ExCEEd Workshop introduces faculty members of all disciplines to the ExCEEd Teaching Model.

November 2017 **STEM Opening Workshop**, *UW System Women and Science Program*, Wisconsin Dells, WI.

Every fall, the Women and Science Program brings new educators in the fields of Science, Technology, Engineering and Mathematics (STEM) together for a two-day workshop. Workshop sessions focus on student-centered pedagogies, classroom and campus climate issues for underrepresented students and active learning strategies as they apply to STEM.

July 2015 **ASTFE Summer Conference**, *American Society of Thermal/Fluids Engineers*, New York, NY.

The ASTFE encourages cooperation and exchange of ideas between engineers, scientists, teachers, students, craftsmen, publishers, manufacturers, and others engaged in the field of thermal physics and allied sciences.

June 2015 **NETI-1**, *American Society for Engineering Education*, Seattle, WA.

The basic National Effective Teaching Institute (NETI-1) is a three-day workshop given twice a year. It is intended to give the participants information and some hands-on practice in the elements of effective teaching—course planning, lecturing, active learning, assessment of learning, and dealing with a variety of problems that commonly arise in the life of a faculty member.

Teaching Experience

Fall 2019 **Introduction to Computational Methods**, *University of Wisconsin Platteville*, 4.8/5.0.

Spring 2019 A combination lecture/computer lab course introducing basic programming concepts using MATLAB. Concepts are applied to a variety of engineering problems and numerical methods to facilitate student learning. Basic linear algebra concepts are also covered, including vectors, linear systems and their solution, linear regression, etc.

Fall 2019 **Computational Methods in Engineering**, *University of Wisconsin Platteville*, 4.9/5.0.

Spring 2018 A combination lecture/computer lab course expanding on the Introduction to Computational Methods in Engineering, this course expands students programming skills (MATLAB or Python) and moves into topics of numerical methods to solve a variety of engineering problems.

Summer 2018 **Fluid Dynamics**, *University of Wisconsin Platteville*.

Summer 2017 While the overall curriculum and approach were very similar to that used in 2015 at UNT, this was the first time streaming. Inductive teaching was successful even for distance education; slide created for whole class.

Spring 2017 **Environmental Control Design**, *University of Wisconsin Platteville*, 4.9/5.0.

A traditional class-room environment course covering heating, ventilation, and air conditioning systems along with design considerations for building heat transfer. Taught the class without having prior experience in the field, but was still able to deliver a quality learning experience by including guest lectures and field trips.

2016-2019 **Thermal Systems Lab**, *University of Wisconsin Platteville*, 4.9/5.0.

Three/four sections of class with four four-person lab groups each are taken through eight labs through the semester covering practical application of theory previously taught in the thermal/fluids classes. Proposed and implemented a complete course overhaul reducing to six labs and recreating nearly all course materials.

Fall 2015 **Computational Fluid Dynamics**, *University of North Texas*, 4.7/5.0.

Fall 2014 Originally based on the same course at Utah State, the instruction materials were completely redesigned to follow the inductive teaching principles learned at the NETI-1. The course redesign resulted in higher student satisfaction and improved learning, as indicated by both exam and project performance.

Spring 2016 **Fluid Dynamics**, *University of North Texas*, 4.4/5.0.

Spring 2015 Two sections of class with approximately forty students each. Largely conventional course instruction, but highly challenging for the students. Final project resulted in a successful hire for at least one student. Second time: applied inductive teaching methods learned at NETI-I, with positive results and feedback from students.

Fall 2010 **Numerical Methods**, *Utah State University*.

Taught while still in graduate school, served as the independent instructor for a Fortran and MATLAB programing class including three lectures and two labs each week. Course evaluations slightly higher than departmental average.

Senior Design Mentoring

Spring 2017 **Particle-image Velocimetry System**.
Supported by startup funds from the college of Engineering, Math, and Science at the University of Wisconsin Platteville, the team developed a low-cost particle-image velocimetry system for use in the Thermal Systems Laboratory class, as well as to support ongoing uncertainty research on the measurement method.

Spring 2016 **Cooled Driving Suit**.
The design team will developed a LN_2-cooled driving suit for racers with a glycol heat exchanger. Project resulted from networking activities with Denton professionals.

Fall 2015 **Solar Race Car**.
Shell Eco racing challenge project. The design team has chosen to focus on body-shell geometry design and material selection, along with design of the internal support frame.

Fall 2015 **Solar Race Boat**.
Solar-powered racing boat competition. Team is focusing on hull geometry, material selection, and manufacturing process.

Fall 2015 **Dune Buggy**.
Design of air inlets and exhaust manifolds for an internal combustion engine. Team considerations include overall performance and noise control.

Spring 2015 **Atmospheric Reclamation**, (First Place).
Cryogenic CO_2 removal project as part of the NASA Texas Space Grant Consortium. A device was designed to remove CO_2 from air using LN_2. Team took first place at the competition.

Fall 2014 **Moisture Vaporator**.
Team designed a moisture collection system based on refrigeration coils to extract and collect water vapor from the air as usable liquid. Project resulted from networking activities with DFW professionals.

Fall 2014 **Flow Meter Calibrator**.
Team designed a small and light-weight water meter calibration system for use by a local business.

Publications

[1] Thomas J Zolper, Scott Bair, and Kyle Horne. Revisiting the asme pressure-viscosity report using the tait-doolittle correlations. *Journal of Tribology*, pages 1–36, 2020.

[2] Hua Yang, Aleksandra Fortier, Kyle Horne, Atif Mohammad, Subhash Banerjee, and Hai-Chao Han. Investigation of stent implant mechanics using linear analytical and computational approach. *Cardiovascular engineering and technology*, 8(1):81–90, 2017.

[3] Hua Yang, Aleksandra Fortier, Kyle Horne, Tre Welch, Atif Mohammad, and Subhash Banerjee. Study of non-linear deformation of peripheral stent mechanics using computational approach. *J Biomed Eng*, 1:1–10, 2016.

[4] Hua Yang, Aleksandra Fortier, Kyle Horne, Witold Brostow, and Haley E Hagg Lobland. Shape memory metal alloys in the context of teaching smart materials. *Journal of Materials Education*, 38(3-4):149–156, 2016.

[5] JY Jeong, KM Lee, R Shrestha, K Horne, S Das, W Choi, M Kim, and TY Choi. Thermal conductivity measurement of few layer graphene film by a micropipette sensor with laser point heating source. *Materials Research Express*, 3(5):055004, 2016.

[6] Tibor Horváth, Zoltán Pásztory, and Kyle Horne. Performance comparison of heat exchanger designs for a seasonal heat storage system. *Energy and Buildings*, 123:1–7, 2016.

[7] K. Horne, A. Fleming, B. Timmins., and H. Ban. Monte carlo uncertainty analysis for photothermal radiometry measurements using a curve fit process. *Metrologia*, 2015.

[8] K. Horne and H. Ban. Sensitivity analysis of the transient torque viscosity measurement method. *Metrologia*, 52(1), November 2014.

[9] K. Horne, H. Ban, R. Fielding, and R. Kennedy. Monte-carlo uncertainty estimation for oscillating-vessel viscosity measurement. *Metrologia*, 49:577–582, 2012.

[10] K. Horne, H. Ban, A. Mandelis, and A. Matvienko. Photothermal radiometry measurement of thermophysical property change of an ion-irradiated sample. *Materials Science and Engineering: B*, 177:164–167, 2011.

Conference Participation

[1] Thomas Zolper and Kyle Horne. An analytical review of the asme pressure-viscosity report from the perspective of the tait-doolittle equation. In *STLE Annual Meeting*, Minneapolis, MN, May 2018.

[2] Kyle Horne Rodolfo Varela. Particle-image velocimetry sensitivity through automatic differentiation. In *American Nuclear Society, New Orleans*, 2016.

[3] K. Horne, T. Antoni, and S. Volz. Molecular dynamics thermal conductivity computation of a quantum cascade laser diode. In *Therminic*, 2015.

[4] K. Horne, M. Chirtoc, N. Horny, T. Antoni, S. Volz, and H. Ban. Thermal properties of chirped superlattice structures through molecular dynamics and photothermal radiometry. In *Eurotherm 103: Nanoscale and Microscale Heat Transfer IV*, 2014.

[5] K. Horne, C. Jensen, and H. Ban. Photothermal radiometry and scanning thermal microscopy measurement of accelerator-irradiated ceramics. In *IWSSTP, Karlsruhe Germany*, 2013.

[6] K. Horne, T. Antoni, S. Volz, and H. Ban. Thermal properties of superlattice structures through molecular dynamics and photothermal radiometry. In *QMNTIA, Reims France*, 2013.

[7] K. Horne, C. Jensen, and H. Ban. Monte carlo uncertainty analysis of thermoproperty measurement by photothermal methods. In *Photoacoustic and Photothermal Phenomena. Focus on Biomedical and Nanoscale Imaging and NDE, Erice Sicily*, 2012.

[8] K. Horne, H. Ban, A. Mandelis, and A. Matvienko. Ptr measurement of an ion-irradiated sample's thermophysical properties. In *American Nuclear Society, Miami*, 2011.

[9] K. Horne, H. Ban, R. Fielding, R. Kennedy, and J. Carmack. Monte-carlo uncertainty estimation for oscillating-vessel viscosity measurement. In *American Nuclear Society, Las Vegas*, 2010.

[10] K. Horne, T. Hauser, and N. Benson. An efficient and flexible parallel i/o implementation for the cgns library. In *Supercomputing, Portland OR*, 2009.

Awards and Honors

2019 **Early Career Faculty Award for Teaching Excellence**, *University of Wisconsin Platteville*.

2019 **Excellence in Teaching**, *National Society of Leadership and Success*.

2018 **SAIF Grant**, *University of Wisconsin Platteville*.

2013 **Fellowship**, *Rocky Mountain NASA Space Grant Consortium*.

2012 **Fellowship**, *Rocky Mountain NASA Space Grant Consortium*.

2012 **Chateaubriand Fellow**, *French Embassy*.

2012 **Outstanding Graduate Teaching Assistant**, *USU Mechanical Engineering Department*.

2010 **International Research Fellow**, *ICMR*.

2009 **Utah State University Vice Presidential Fellowship**.

2009 **Finalist: Storage Challenge**, *Supercomputing*.

2008 **Vice President**, *Tau Beta Pi USU Chapter*.

2008 **Academic Excellence**, *USU Mechanical Engineering Department*.

2003 **Outstanding Pre-Professional**, *USU Engineering Department*.

2002 **Utah State University Presidential Scholarship**.

2002 **Eagle Scout**, *Scouts BSA*.

Languages

English Native

Hungarian Fluent

Computer skills

OS Linux, Windows

Compiled Fortran90/03+, C/C++, Java, Ada

Scripting Python, Matlab, Julia, Shell

Simulation Lammps, GULP, GROMACS, Fluent, COMSOL, MOOSE, ElmerFEM, OpenFOAM, DAKOTA

Analysis Scipy, Sympy, Maxima, MathCAD

Post-processing Paraview, Visit, Mayavi, GMSH

Libraries MPI, OpenMP, Qt, OpenGL, Eigen, fftw, matplotlib, UMFpack, Lapack, DISLIN, MkLearn, Numba