ACADEMIC PORTFOLIO

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PERSONAL STATEMENT

The purpose of this academic portfolio is three-fold:

- First and foremost it ***documents – in an empirical, evidence-based fashion – my activities and accomplishments*** in research, teaching, and service.
- Second it is a vehicle for ***organizing my research, teaching, and service priorities***, and for developing and refining my short- and long-term career goals.
- Finally it is a way to ***describe my key activities to professionals in other fields*** in a clear, concise fashion for grant applications, proposed collaborations, dissemination of research results, and promotion of Nuclear Engineering Program and Missouri University of Science and Technology.

When I was a junior in Nuclear Engineering at Purdue University, I was struggling during the Fall semester of that year. I was working two jobs to pay room and board and taking a full time course load. Staying up until 2 a.m. working meant that I was missing some class time, particularly in the course "Fundamentals of Nuclear Engineering". My partner in the course dropped out of sight after the first exam, so I was finishing group homework on my own each week. I was still making an A in the course, but it would be generous to call it a challenge. The professor teaching the course took notice, and took me aside after class one day to ask me what was going on. I explained about working and my partner not being around and promised her that I would ask for help if I needed any, then went on my way. I really didn't think anything of it. A few days later she took me aside again and said "I think you need to be involved in research. Pick any professor in the department that you would like to work with and I will talk to them to recommend you." I spent a few days looking through the research each faculty was involved in and what courses they were teaching. In the end I asked for a recommendation to Distinguished Professor Mamoru Ishii, a world-renowned expert in nuclear reactor safety. The next day she told me I should show up at his office at 9:00 on Thursday morning.

I will admit to being just short of terrified about meeting him. I hadn't had any courses with him, and I had heard from some of the graduate students that – let's just say he had very high standards, and not all of the students met those standards. However the angst was really unnecessary. We spoke briefly about some of the research he was doing, he had a few questions about my transcript and work background, and we discussed my research and career interests. After about half an hour he agreed to hire me as an undergraduate laboratory assistant to work on a new project. I found out later that I am the only undergraduate student he ever hired. This really turned my year around. I still had to work two jobs, but now one of them was interesting and directly related to my chosen field. I had additional academic support, both because I was spending more time with faculty and because I had the chance to work with graduate students in the field. As a faculty member myself, I hope that I can have that kind of impact on the students I work with every day.

So I decided that I wanted to follow in their footsteps. I continued on to graduate school with Prof. Ishii as my advisor. In addition to research I was active in service and sought out chances to teach. I was one of the founding members of the Nuclear Engineering Ambassadors at Purdue University, a group of top students given responsibility for assisting in recruitment and fundraising events. I travelled to local high schools to give presentations. When faculty were traveling to conferences, I asked if I could teach their class while they were gone. This was – and still is – sometimes difficult for me because I am not naturally outgoing and talkative. But it was important to me, and well worth the effort. In research, I asked to help write proposals and be given more responsibility. After watching me tutoring a few Juniors in reactor physics one morning, the student services assistant responsible for advising all the students in the department told me "If you don't become a professor and teach, you will be wasting your talent."

My advisor appreciated the fact that if he asked me to do something, he knew that if he left me alone it would get done on time without the need for close supervision or micromanaging. After I earned my doctorate in 2012 he hired me as a postdoc. In that position I was responsible for managing all of the active research projects and acting as an interface between my advisor and the graduate students working in his laboratory. This was my first exposure to the administrative side of academic research, and I learned a lot in the first few months. After about a year and a half we met to discuss my future plans. He said "I think you have learned everything you can from working here, you are ready to move on". A few months after that, in early 2014, I was hired at Missouri S&T. I very quickly developed a long-term plan for teaching, set key goals for my research program, and involved myself in forward-looking service activities. The details of those activities will be discussed throughout the rest of this portfolio, along with descriptions of the rationale and significance of those activities.

I have had to overcome challenges while here as well. Due to renovations and construction, my laboratory was not complete until three years after my arrival. I have been moderately successful in obtaining grants for computational and analytical research, but experimental research is my true passion and I am now beginning to submit grant proposals for experimental research and develop experimental capabilities in earnest. Thus far my research program has **resulted in $665,000 in grants in the past 5 years**, **54 peer-reviewed journal publications** with an **h-index of 19**. This led to a **Young Member Achievement Award** from the Atomic Energy Society of Japan in 2017. I have also been trying to balance research efforts with higher-than-usual teaching loads for an early-career faculty member. I have often taught two or three courses each semester, and had to prepare seven different courses (eight different course numbers) during my first seven semesters as a professor. My teaching focuses on **team-based, problem-based learning**, and constructive criticisms from the students have been very helpful in adjusting my teaching methods to the needs of the learners. Over the past year my teaching evaluations have exceeded the university average score for instructors. My service activities have been focused on influencing the future development of the Nuclear Engineering Program and expanding the visibility of my research program and related activities. I serve as the Undergraduate Coordinator for Nuclear Engineering. In the past two years I have participated in more recruitment events than any other faculty in the program.

On a personal note the birth of my two sons – Ethan just before I arrived at Missouri S&T and Larkin two years later – has been both a blessing and an adventure for my wife Amanda and I. Ethan spent two months in the hospital before he was able to come home – two weeks of that attached to a heart-lung machine that breathed and pumped his blood for him – due to a serious case of pneumonia. But he fought very hard to heal and he has grown into a precocious and energetic seven-year-old. Larkin loves to talk about everything he sees, make up songs about his everyday life, and push any and every boundary in his life. It is a joy to arrive home at the end of each work day to spend the evening playing with cardboard boxes, blocks, Legos, cars, and whatever else seems interesting to them that day.

Overall I believe that I have been quite successful. The remainder of this document will cover, in detail, the numbers proving that case: research dollars, CET scores, and everything else. But more important to me are the students who have told me "I am lucky that you were my advisor," "You are going to be a great teacher," or "I learned so much from that class, it has really helped in my other classes." In reviewing my tenure case, the Dean of CEC wrote in his recommendation that "A strong case has been established for superior performance in teaching, research, and service." I have already begun to have an impact on the students I interact with every day, as the professor in that Fundamentals of Nuclear Engineering course had on me.

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RESEARCH AND SCHOLARSHIP

RESEARCH STATEMENT

All university-level research programs have certain common goals: ***Discovering*** new knowledge, ***Integrating*** that knowledge with what we already know to achieve a deeper understanding of the world around us, ***Applying*** knowledge to make the world a better place, and ***Teaching*** that knowledge to others so that they can continue the process. Within that framework each individual faculty member has specific long- and short-term goals related to the development of their field. My research has been focused on the application of the principles of heat, mass, and momentum transfer to nuclear reactor systems. In the long-term, my goal is to ***become a nationally and internationally recognized expert*** in multiphase flow processes, specifically in the improvement of nuclear reactor performance and safety and energy efficiency. I plan to accomplish this goal by:

- Improving our scientific understanding of key phenomena important to industrial applications such as turbulence, interfacial behavior, and so on.
- Applying fundamental principles of physics to develop, evaluate, and refine models for multiphase flow systems
- Validating those models using high-quality experimental measurements and innovative measurement techniques
- Mentoring PhD candidates to produce qualified, creative faculty to continue developing the field.

My general research interests have been focused in a few key areas. One has been ***creating new methods for evaluating and optimizing multiphase flow models***. From this area has grown an interest in the development of new instrumentation and the continuing improvement of existing types of instrumentation for measuring important parameters in two-phase flows. Finally, I have also been involved in applied research, solving key problems related to industrial applications of multiphase flows.

Throughout this process, my efforts have led to numerous publications and citations and significant research funding. I have published a total of 51 journal publications. This number does not include a book chapter on two-phase flow in large diameter pipes, nor does it include peer-reviewed conference proceedings. One was published in a journal with **impact factor of 6.4**. Perhaps more important than publishing is making sure that people are reading and using the work. Based on data obtained from my Google Scholar profile, I have an **h-index of 19**.

Funded grants and proposals are listed in Table 1. As the table indicates, I have obtained **$665,000 in funding** over the last 5 years. Additional details can be found in my Curriculum Vitae, in Appendix A. I am also continuing to submit research proposals. Based on my publication and funding record, according to the Dean of CEC, I "have demonstrated outstanding scholarship in thermal hydraulics."

Also important is the development of a national and international reputation for excellence. I have already begun to develop such a reputation. I have developed a collaboration with Dr. Xuizhong Shen, a researcher at the Kyoto University Research Reactor Institute in Japan. I have been approached by the Institute of Nuclear Safety Systems, a subsidiary of the Kansai Electric Power Company in Japan, to perform funded research on reactor safety analysis codes and model development. Finally, my work has been cited by researchers in a wide range of fields and by researchers across the globe. The fields range from nuclear applications, to the propagation of gas bubbles in volcanic magma, to the development of models for gas-oil flows in oil wells. Recently the Korean Atomic Energy Research Institute **(KAERI) began including a correlation I developed in their nuclear reactor safety analysis code SPACE**. This work has also led to a **Young Member Achievement Award** from the Thermal Hydraulics Division of the Atomic Energy Society of Japan, citing my "extensive and original research contributions to the development of the interfacial area transport equation."

The data resulting from this research has been used by organizations ranging from the U.S. Nuclear Regulatory Commission, Bettis Atomic Power Laboratory, and Chevron Energy Technology in order to validate computer codes. At the NRC this includes **validating TRACE,** an industry-standard nuclear reactor safety analysis code, and the development of TRACE-T, a beta-version code which includes implementation of detailed bubble coalescence and breakup models. Bettis Atomic Power Laboratory has used the experimental data to **validate the multiphase flow models in commercial CFD code CFX**, produced by ANSYS. Chevron Energy Technology is using data I produced to develop design improvements in their oil processing systems, saving money and improving resource utilization. Detailed void fraction measurements at various points along the suction piping for ECCS pumps were used by Westinghouse Nuclear to justify the safety of the systems to the NRC in response to Generic Letter 2008-1. The results were used by NRC to create training materials for nuclear plant operators. INSS implemented the resulting model in their custom version of RELAP5. The results of the steam condensation study will be used by the Consortium members in their licensing applications to the US NRC.

Last, but not least, the mentoring of PhD candidates is an important part of our research mission. In 2018 my first PhD student graduated. **He served as the Director of Engineering** at Phase Change Energy Solutions, Inc., a premier engineering design firm developing thermal management solutions across several industries from electronics cooling to food storage and transportation. He is now a research scientist in the Systems Integration Laboratory at INL. Five other students obtained a PhD since. One student is working in the thermal hydraulics group at INL, two have positions in the Navy Nuclear Laboratory, and two are planning to enter academia. I expect three additional students to obtain PhDs this year. The Dean of CEC wrote in his recommendation for tenure "The fact that you have produced four PhD and three MS students under your supervision while at S&T is truly exceptional."

Table 1: Funded Research Activities, Last 5 Years

Project Title	Sponsor	Dates	PI	Total Funding	Shared Credit
Training and Support for Electrical Conductivity Probe Assembly and Use	LSU	January 2023-June 2023	Dr. Joshua P. Schlegel	$13,500	$13,500
Procurement of Spare Parts for Instrumentation Channels, Electronics Test Equipment, and Power Uprate Study at the Missouri S&T Reactor	US DOE	October 2022 - September 2023	Dr. Joseph Graham	$250,000	$30,000
Using Computational and Analytical Methods to Optimize High Heat Flux Component Thermal Performance in Magnetic Confinement Fusion Reactors	US DOE	March 2021 - March 2022	Dr. Joshua P. Schlegel	$100,241	$100,241
Undergraduate Scholarships in Nuclear Engineering at Missouri S&T (2020-2022)	US NRC	August 2020 - July 2022	Dr. Joshua P. Schlegel	$200,000	$120,000
Computational Fluid Dynamics for Fusion Component Cooling	US DOE	August 2020 - December 2020	Dr. Joshua P. Schlegel	$11,680	$11,680
Undergraduate Scholarships in Nuclear Engineering at Missouri S&T (2019-2021)	US NRC	August 2019 - July 2021	Dr. Joshua P. Schlegel	$200,000	$120,000
Graduate Fellowships in Nuclear Engineering at Missouri S&T (2019-2021)	US NRC	August 2019 - July 2021	Dr. Ayodeji Alajo	$400,000	$120,000
Overhead Crane Installation and Enhancement of Distance Learning at Missouri S&T Reactor	US DOE	October 2018-September 2019	Dr. Ayodeji Alajo	$250,000	$41,667
Undergraduate Scholarships in Nuclear Engineering at Missouri S&T (2018-2020)	US NRC	August 2018 - July 2020	Dr. Hyoung-Koo Lee	$200,000	$100,000
Radiation Response of Phase Change Materials for Space and Nuclear Applications	MRC	April 2018 - July 2018	Dr. Joshua P. Schlegel	$8,500	$8,500
				Total	$665,588

DESCRIPTION OF RESEARCH

Multiphase Flow Experiments and Modeling

The first step in the scientific method is observation – the collection of experimental data, and a key part of creating new knowledge. Experimental data is also intimately involved in testing hypotheses (models) that are developed to explain those observations. To that end, I have performed a great deal of experimental work over the course of my career. A significant portion of that experimental work has been the collection of an extensive database of bubble behavior relevant in a wide range of systems. These include:

- Large diameter tubes such as oil wells and vertical risers, chemical processing systems, and vertical risers in natural circulation Boiling Water Reactors.
- Tube bundles such as nuclear reactor cores and steam generators and chemical process cooling systems
- Rectangular channels such as those found in many nuclear research reactors and nuclear reactors for Naval applications

I have established the Thermal Hydraulics Experiment, Modeling, and Engineering Simulation (THEMES) Laboratory at Missouri S&T. Infrastructure necessary for experimental research was recently completed, and I am establishing test facilities for multiphase flow research. The highlights of the THEMES laboratory include

- A 50 hp air compressor capable of delivering up to 207 acfm of compressed air at a pressure of 150 psi and a 30 hp centrifugal pump which produces 90 ft of head at a flow rate of 1000 gpm;
- Modular test facility design to reduce construction times;
- Instrumentation including various flow meters, electrical conductivity void probes and electrical impedance void meters, etc.;
- Facilities for testing phase change materials including a Transient Hot Bridge (THB) and high-precision, temperature controlled environments allowing thermal property measurements at temperatures ranging from -5ºC to 200ºC;
- Access to the Materials Research Center (MRC) at Missouri S&T for advanced materials characterization;
- An existing multiphase flow test facility for rectangular channels.

In the spirit of enhancing the ability of researchers to provide high-quality data for validation of models, I have also been part of the development of advanced two-phase flow instrumentation. As a graduate student I developed a computer-controlled electronic positioning system capable of positioning void probes inside of a flow channel to within 0.1 mm. Previously, void probes had been positioned by hand using micrometer scales. I then combined this with a multiple-void-probe system and a high-capacity data acquisition system capable of collecting up to 2.5 million samples per second. As a result I was able to **perform complex experiments in 15-20 minutes that previously required 3-4 hours**.

I have been working to develop more robust methods for constructing probes. Typical failure rates for probe construction are greater than 50%, leading to significant losses in both resources and time. Using our in-house electronics facility, I have been working to improve both the construction and characterization process, as shown in Fig. 1.

Figure 1: Improved conductivity probe construction and characterization process

Some key improvements include:

- Use of high-strength dielectric epoxy to coat sensors, with roughened sensor surface to improve adhesion and reduce film draining and beading;
- Soldering the wires to sensors rather than crimping, to reduce breakage and create a more stable electrical connection;
- Use of a camera-equipped microscope, allowing more accurate measurement of sensor positions through image analysis;
- Storage of images and improving the ability to confirm, review, and repeat data analysis (as compared to handwritten notes).

There are also some major concerns regarding the data processing methods used for these types of probes. Specifically, most data processing schemes use the bubble chord length measured by the probe to classify bubbles as Group 1 (small spherical and distorted-spherical bubbles) or Group 2 (Taylor cap and slug or churn-turbulent bubbles). There is a concern that this process incorrectly categorizes many Group 2 bubbles near the size limit as Group 1, since the chord length is often significantly smaller than the bubble diameter. As a result of this and other concerns I have implemented a number of improvements to the data processing software, such as:

- Implemented a moving comparison algorithm rather than a threshold to reduce incorrect grouping of rapidly-following trailing bubbles into one large bubble;
- Implement a trust-region method to calculate the diameter of all bubbles previously categorized as Group 1 using a solid-sphere approximation and the interfacial velocity of the front and rear interface to reduce bubble categorization error.

The results from the electrical conductivity probes were also compared with measurements performed using optical void probes. Optical void probes were provided by the mREAL laboratory at Missouri S&T, led by Prof. Muthanna Al-Dahhan. Previous studies have confirmed that the total void fraction and interfacial area measurements made using these two sensors agree well, however the bubble group categorization has not been confirmed. These improvements were implemented and the two data processing methods were compared for a small number of test cases.

The second through fourth steps of the scientific method are developing hypotheses, testing hypotheses, and revising hypotheses. The development, optimization and evaluation of two-phase flow models falls under these steps. As part of this work I have developed new flow regime maps and drift-flux models in large diameter tubes. The publication that resulted from this work, published in 2010, became **one of the 10 most-cited papers in the journal Progress in Nuclear Energy from 2010 to 2014.** I have also spent time evaluating the prediction uncertainty of the two-phase flow models used in TRACE and RELAP, industry-standard safety analysis codes. As part of this work I developed a revised drift-flux model for the prediction of interfacial drag. The revised model was able to significantly improve the prediction of high void fraction cases in the vertical riser of advanced boiling water reactors. I also developed a new interfacial area concentration correlation by deriving the Sauter mean diameter of both small, spherical bubbles and large Taylor bubbles from the steady state two group interfacial area transport equation. After benchmarking with experimental data, the prediction of interfacial area concentration was significantly improved over current industry-standard approaches, as shown in Fig.2.

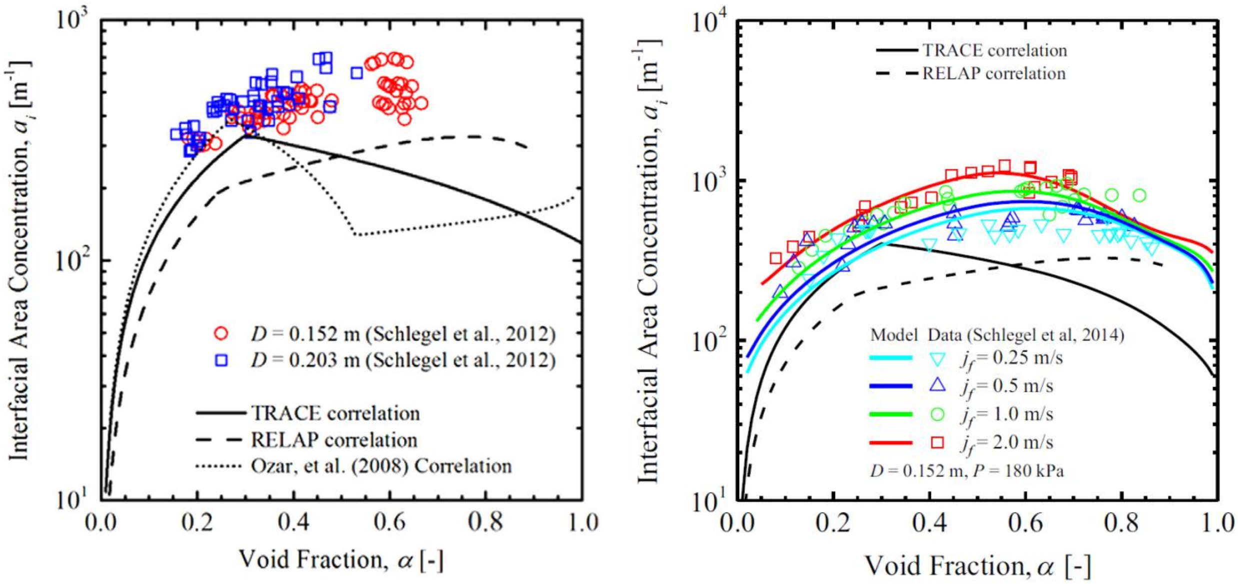

Figure 2: New correlation for interfacial area concentration

The centerpiece of this portion of my research over the past few years has been the development of a modular, one-dimensional two-phase flow analysis code using MATLAB. Based on the two-fluid model used in RELAP and TRACE, I implemented a full two-bubble-group approach with void transport and interfacial area transport. At this time the code is limited to vertical flows without heat transfer, but it is a powerful tool for evaluating and comparing models. All of the constitutive models within the code are modular, allowing me to evaluate the sensitivity of the system to changes in the various parameters that are key to accurately predicting multiphase flows.

In the spirit of that effort, I have developed an objective optimization technique for two-phase flow models that uses this code as a key component. Using principles from Pareto optimization and implementing a modified form of the Gauss-Newton algorithm, I was able to make some key revisions to the two-group bubble coalescence and breakup models for large diameter tubes. The resulting model was able to reduce the interfacial area concentration prediction error from 52% to 33%. I am continuing to use this approach to evaluate the sensitivity of the code to key models. At this time I am focusing on the drift-flux type correlations which are used to calculate the interfacial drag forces, thereby determining the phase concentrations, flow rates, and coolant inventory in nuclear reactor systems. In the near future I will also be evaluating various interfacial area concentration correlation schemes and the addition of void covariance effects in the two-fluid model, a phenomenon which has been neglected until now.

Enhancing Passive Safety in Nuclear Reactor Systems

My interest in enhancing passive safety in nuclear reactor systems is driven by the rise of small modular reactor (SMR) systems. These reactors are much smaller, and therefore have much smaller thermal loads. This lends them to various passive safety systems that are impractical in larger designs. One of the most direct applications is the use of Phase Change Materials (PCMs) in SMRs. PCMs are materials that are designed to freeze and melt at a specific temperature, and have a high heat of fusion. This allows them to absorb large amounts of thermal energy at a relatively constant temperature. In the long term, I plan to develop research on the **application of high-temperature PCMs to enhance passive safety in nuclear reactor systems**. I hope to design PCM systems that can be incorporated into the emergency core cooling systems of modern reactor systems such as the suppression pool and reactor containment. Incorporating PCMs with phase change temperatures in the range of 80 – 90ºC in the suppression pool and containment structure has the potential to absorb more heat, reducing the containment pressure and temperature. This allows smaller containment and reduced construction costs.

I began this work by investigating room-temperature PCMs. While this is a first step in a larger research program, it also has important potential impacts. The use of PCMs can reduce energy consumption in heating and cooling by 30% to 50%, **reducing energy costs and greenhouse gas emissions**. My research team developed a novel eutectic PCM using Methyl Palmitate and Lauric Acid, both naturally occurring fatty acids. The resulting PCM has a melting temperature of 25.5ºC and a heat of fusion of 205.2 kJ/kg. Properties drifted by only 1% during 3000 melt/freeze cycles, which represents about 80 years of daily thermal loading and unloading. This PCM may also have applications to space travel: NASA's ORION mission uses and PCM based heat exchanger to reduce the required radiator size for thermal management. There are two major concerns associated with this type of PCM. First is leakage of the liquid phase, which causes loss of material and therefore degrades performance. Second is the low thermal conductivity of most organic PCMS, resulting in large thermal gradients that impede the ability of the materials to maintain the internal environment at a constant temperature. To remedy these concerns, two modifications to the PCM were made. First a gelling agent was added. This gelling agent results in a solid-gel phase change and a form-stable PCM that will not leak. Second, graphene nanoplatelets were added to the mixture. These changes had no effect on the melting temperature, but reduced the energy storage capacity to about 180 J/g and increased the thermal conductivity by 100%. Further, the addition of nanoparticles reduced the supercooling typical of organic PCMs by providing nucleation sites for freezing to begin. This reduces the difference between the melting and freezing temperatures, improving the temperature management capability of the PCM.

Recent research on this subject has focused on the ability of these materials to resist radiation damage during use. Two different PCMs were exposed to radiation using the Missouri S&T Reactor (MSTR) and the Missouri University Research Reactor (MURR). The melting temperature and latent heat of the samples were measured before and after irradiation in order to evaluate the potential lifetime of the materials in a radiation environment. The measurements found no significant change in these properties at radiation doses up to 2800 Gy, representing just under one year in a nuclear reactor containment or the approximate duration of a manned journey to Mars.

Steam Condensation for Reactor Safety Applications

I was also a co-PI on a project for the Small Modular Reactor Research and Education Consortium (SMRrec). This project involves the design and construction of a test facility to investigate scaling effects on condensation heat transfer in SMR passive cooling systems. The Passive Containment Cooling System (PCCS) is one of the most important passive safety systems used in small modular reactors (SMRs). The containment vessel (CV) forms an integral part of the PCCS system. At the time an accident is initiated, steam is released from the Reactor Pressure Vessel (RPV) into the CV. This steam condenses on the CV walls. This leads to condensation heat transfer from the RPV steam to the containment wall. The condensate is returned to the reactor core through drain lines. It is well documented that the presence of even a small quantity of non-condensable gases (NCGs) greatly influences the condensation process. Research in the COndensation Rate for Passive Safety (CORPS) test facility aims to study the characteristics of heat transfer of a PCCS in the presence of non-condensable gases. Specific objectives for this research are:

- Review and evaluate existing data and models for condensation heat transfer for application to Westinghouse SMR (W-SMR) containment condensation
- Perform experiment and CFD simulations to evaluate the scalability to predict condensation heat transfer with and without NCGs.
- Evaluate and validate the effectiveness of the CFD simulations in scaling of condensation phenomena for different diameter pipes

The experiment will be compared with CFD predictions generated using STAR-CCM+. It was observed that the software predicts the general trends of temperature distribution at various axial and radial locations. However errors in the prediction of heat transfer coefficient were significant, as they ranged from 68% near the inlet to 38%. This can be attributed to the heat flux calculation method adopted by the software. Specifically the nucleation site density for condensation is a user-input parameter that has significant effects on the calculated heat transfer rate, however little to no guidance or framework exists for modeling or selecting this parameter. This shortcoming limits the ability of STAR-CCM+ for predictive design calculations, where the nucleation site density is not known *a priori*.

TEACHING AND MENTORING

TEACHING STATEMENT

We do not evaluate faculty on how much they teach, but on how much their students learn. Those of us from academia have a long history of learning – and should therefore have a great deal of experience to draw upon. One of my best experiences as a learner was in my high school calculus and physics courses. Both courses were taught by the same person. What I remember most about those classes was the ***sense of discovery*** – the 'aha!' moments that occurred throughout the class. I realize now that those moments were the result of his careful planning – that he guided us toward the answer almost without us realizing that we were being directed.

In each of my courses, I have a few basic goals:

1. Help students accept responsibility for their own learning and develop a passion for discovery.
2. Teach students to think through problems logically and be able to explain their process.
3. Make sure students understand the basic physical principles behind key equations and concepts and relate those concepts to their real-world experience.
4. Guide students to realize how the concepts they learn in their various classes are integrated in real processes

I use several strategies to continuously improve my teaching:

- Designing varied active learning activities to appeal to different learning strategies, including in-class lectures, short on-line video lectures, and small-group problem solving activities
    - Implementing team-based learning to improve engagement and shift from large-classroom to a small-group teaching environment
    - Encouraging peer accountability with a peer evaluation process
    - Providing more focused 'mini-lectures' addressing specific concerns of individual student teams
    - Using real-world examples from research and industry, and allowing student teams to come up with their own solution to open-ended or forward-looking questions.
    - Encourage appropriate use of information technology in the classroom – for instance, using smartphones to access course materials on Canvas or look up outside data needed to solve problems.
- Use my experience in theater (I have volunteered extensively as a Master Electrician and Lighting Designer for theatrical productions) to refine classroom presentation skills – vocal inflection, control of body language, use of humor and stories to accentuate classroom material and communicate excitement for the subject.
    - Be humble and honest, willing to accept constructive criticisms. Sometimes the ability to accept and understand your own mistakes can help students connect with you.
- Informal mid-semester feedback following each exam – what worked, what didn't, and

what should I be doing?

- Set high – but realistic – expectations. I have found that once the students understand what those expectations are many of them rise to the challenge. Treating them like adults allows them to treat themselves like adults and take the responsibility for their performance on themselves.

This approach can be seen in the student comments in Appendix C, such as “Invests the time to cover examples in detail. Works clearly and easy to follow. Good communicator,” “Dr. Schlegel was willing to improve on his teaching skills and in the way he taught constantly, which was one of his biggest strengths,” “The course structure is one of the best on this campus,” and “Very tough, made me push hard to earn a grade.” The Dean of CEC observed “I am impressed by the quality and volume of your teaching, which shows true dedication to students and colleagues alike.”

Finally, we need to remember that **learning should be fun**. Learning is exploring the world around us in new ways. It is our responsibility to show students that even after decades of working in our fields we still enjoy our work and continue to discover **new and interesting things.**

TEACHING RESPONSIBILITIES

I am typically responsible for four classes each year: Reactor Fluid Mechanics (NUC ENG 3221), Reactor Heat Transfer (NUC ENG 3223), Introduction to Nuclear Thermal Hydraulics (NUC ENG 4257/5257), and Advanced Nuclear Thermal Hydraulics (NUC ENG 6257) or Probabilistic Risk Assessment (NUC ENG 4281/5281). For several years I also taught Nuclear Systems Design I (NUC ENG 4496). The syllabi for these courses can be found in Appendix B. My recent overall effectiveness scores for these courses can be found in Appendix A. Scores for Senior and Graduate level courses have remained high, above 3.0 since my second semester at Missouri S&T and most recently near 4.0. My scores in Junior level courses have varied, but for the last three years have remained at or above 3.7. Implementing a team-based, problem-based class structure and a partially ‘flipped’ classroom, along with improvements suggested by each class and further course development, has increased my effectiveness in those courses. Overall the change in instruction method has greatly improved student engagement in the classroom and the quality of student learning, as evidenced by an **Outstanding Teaching Award** earned in 2021. I plan to continue developing and improving the courses over the next few years.

SERVICE

SERVICE STATEMENT

Many faculty treat service as an obligation to be avoided. As junior faculty we are often told to focus on research and teaching – that service is somehow less important. I disagree with this view. Service should be just as **forward-looking and strategic** as research and teaching, if not more so. Service is a great way to increase visibility and **make an impact** on the future of the discipline, university, and department. It is a way to build strong professional relationships and develop partnerships. It is a vehicle for sharing knowledge and creating ideas.

Since arriving at Missouri S&T I have worked to target my service activities to those I believe will have an impact. I have requested committee assignments that put me in a position to have a positive impact on the future of my department. Professionally, I have actively sought out reviewing assignments and been an active participant in highly visible professional conferences. These assignments will be detailed in the next few sections.

DEPARTMENTAL AND INSTITUTIONAL SERVICE

As stated above, my departmental and institutional service has been focused on areas that will allow me to have a positive impact on the future. Some of this service includes things as basic as meeting with prospective students or developing courses. In addition I have initiated some activities that do not fall under a committee – such as a review of the number of students, number of faculty, and key productivity measures for high-ranking Nuclear Engineering programs. The hope is that this process will help us identify areas that we can address to improve our impact and visibility. I make sure that I am available to help other committees when necessary and strive to be involved in departmental concerns and development. Much of this work is integrated with my every-day teaching and research activities, however I would like to take this opportunity to address a few key areas:

Associate Chair - Academics

I currently serve as the Associate Chair for Academics for the Nuclear Engineering and Radiation Science Department. In this position, I work closely with the staff advisor for our undergraduate students and am responsible for our ABET and HLC preparedness: I keep records of department performance on the metrics we use to determine whether we meet student outcome requirements, put together yearly reports on the results, wrote the previous Self-Study Report for Nuclear Engineering, and coordinate the collection of materials for the site visits. This process can be challenging at times. Working to find a way forward for students who have struggled during their first semesters or students who came to Missouri S&T without the necessary background in mathematics can be both trying and time consuming. But it is also very rewarding. Seeing those students get back on track and watching them succeed – and knowing that I was a part of that – is very gratifying. As part of this effort I completely re-designed our senior exit survey after reviewing the exit surveys of various other departments within the university and nuclear engineering programs at other universities. The new survey gives us a much better idea what our students did and did not like about their experience and provides additional data regarding key ABET metrics. This assignment also gives me the ability to suggest and argue for changes that I think are necessary to keep our program competitive in the national and global market.

As part of this effort I was asked to work with Educational Technology to create a short introductory video. After discussing their intent with the Freshmen Engineering Program and meeting with EdTech I prepared a script and worked with them to record the video, which they then edited. I also suggested that Educational Technology get in touch with several current and former students for short interviews. I suggested a list of possible students and interview questions. The result was a short video of students giving their perspective on the Nuclear Engineering Program – a perspective that incoming Freshmen should find very valuable. The videos were so successful that the Program Chair for Nuclear Engineering is adding them to the program web page.

I also have taken the lead on our department's recruiting and retention efforts. As part of this effort I work with the Admissions office to coordinate and develop recruiting events. These include visits to the Missouri S&T Reactor, trips to speak with local high school students, participation in a variety of campus events, and so on. I am also developing new retention programs to help first-time college students adapt to the University environment, make connections with other students, and succeed in their first-year courses. As part of these efforts I am also leading the development of our department's social media presence. This includes developing content for our Facebook and Twitter feeds to announce upcoming events and distribute important news. I am also establishing Instagram and TikTok accounts for the department that will allow us to reach new audiences with information about nuclear science and engineering, and updates regarding department activities.

Department Committees

I have also been serving on a number of key department/program committees. The list of these committees can be found in Appendix A. Again, the selection of these committees reflects my conviction that service should be forward-looking and strategic.

I requested to be assigned to the search committee for the Mining and Nuclear Engineering Department Chair in 2017. I also requested assignment to the search for the Nuclear Engineering and Radiation Science Department Chair in 2021. I viewed these as key opportunities to have a strong voice in the selection of the individual who will lead our department for the foreseeable future. It was a valuable learning experience. I was able to see first-hand many key university functions and meet a number of interesting people.

In the next several years I plan to continue this strategic selection of service activities in order to continue to have an impact on the Nuclear Engineering program, our department, and the university.

Professional Societies and Journals

Service in professional societies and journals is one of the most effective ways to increase personal and institutional visibility. Professional organizations and conferences provide the opportunity to present your work, receive feedback from other experts, share knowledge, and build collaborations and partnerships.

I am an active reviewer for 21 professional journals related to nuclear engineering and multiphase flow. Over the last two years I have completed 25 reviews for those journals. This has given me the chance to review current research in my field, get ideas for research topics, and identify possible collaborators. In addition to this, it has allowed me to establish myself in an expert in the field with valuable viewpoints.

I have also been active in professional conferences. Over the last few years I have served as a reviewer for six conferences, reviewing 12 manuscripts. I attended two of those conferences and served as a session chair during NURETH 16, one of the most popular conferences on nuclear reactor thermal hydraulics in the world, with representatives from Japan, China, India, South Africa, and many European nations. In the future, I plan to increase my activity within the Thermal Hydraulics Division of the American Nuclear Society.

Service to the Community

Community service is an often-neglected component to professional service, but it is also important due to its uniqueness. Community service allows us to work with other members of the community – people we would not generally meet during our professional work. It allows us to spread the discussion of our research and educate people who are not experts in our field and – truthfully – may not be technical professionals at all. It allows faculty to increase their visibility in the community and build up the reputation of the university and the departments, and it allows faculty to pursue interests outside of their research and teaching.

For my part, I have long had an interest in theater. This is partly why I often view teaching as performance art. I have volunteered to serve community theaters in a technical capacity, as master electrician and lighting designer, for a number of years prior to moving to Rolla. During that time I set up lighting for five major musicals and at least a dozen more minor shows. For one of those musicals and three of the minor shows I was also the lighting designer, planning how each scene of the show would be lit to produce the desired emotional and dramatic effect for the audience. I found both experiences to be extremely rewarding. I recently starting serving as a lighting designer and technician at Gear City Church in Rolla.

I have also had the opportunity to serve as a volunteer coordinator for HorrorHound Weekend. HorrorHound Weekend is a convention held twice each year, in Indianapolis, IN and Cincinnati, OH, to celebrate thriller and horror movies. Actors from various films and franchises are invited, along with special-effects artists, directors, and other professionals. People from all walks of life attend to meet celebrities and have fun. Part of the show my responsibility was to schedule volunteers at the various duty stations and make sure they got there, then make sure that they had the resources they needed to do their jobs. I also acted as security for various events during the convention. The experience was a lot of fun for me.

Through these admittedly unique activities, I was able to learn a great deal about performance and met many interesting people. And of course, when they found out that I was a nuclear engineer, I had the opportunity to discuss my field, my research and the university with those people. Unfortunately I have not had the opportunity to continue these efforts over the last year for personal reasons, however in the next two to five years I hope to renew my involvement in these activities.

APPENDICES

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APPENDIX A – CURRICULUM VITAE

Joshua P. Schlegel

Associate Professor

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SUMMARY

I am a professor in Nuclear Engineering specializing in nuclear reactor thermal hydraulics. I work extensively on interfacial area transport and bubble hydrodynamics, especially in large-scale industrial systems. As an instructor, I am working to bring a more hands-on approach to the classroom through problem-based, team-based learning techniques based on ongoing research.

EDUCATION

Ph.D. in Nuclear Engineering, Purdue University (December 2012)
M.S. in Nuclear Engineering, Purdue University (May 2009)
B.S. in Nuclear Engineering, Purdue University (May 2007)

CURRENT POSITION

Associate Professor, Associate Chair - Academics, Department of Nuclear Engineering and Radiation Science, Missouri S&T (March 2014 – Present)

- Educating the next generation of nuclear scientists and engineers
  - Earned overall effectiveness of **3.8/4.0** using team-based and problem-based techniques
  - Advised **eight PhD graduates** and **four MS graduates**, with one additional advisee currently pursuing a PhD degree and one pursuing a MS degree
  - Developed a new course in **Probabilistic Risk Assessment** in consultation with industry experts, one of very few undergraduate courses in the U.S.
  - Established new recruiting and retention programs for undergraduate students
- Researching solutions to thermal-hydraulics challenges
  - Obtained **$665,000** in research funding over five years.
  - Published 54 papers in peer-reviewed journals with ***h*-index of 19**
  - Developed new solid-gel eutectic phase change material for heating and cooling applications
  - Developed and implemented a method to compute bubble diameter using data from electrical resistivity and optical void probes
  - Developed a mathematically rigorous method for benchmarking semi-empirical multiphase flow models against experiments based on Pareto optimization techniques

AWARDS AND HONORS

Outstanding Teaching Award, Missouri University of Science and Technology, *2021*
Young Member Achievement Award, Thermal Hydraulics Division, Atomic Energy Society of Japan, *2017*

Eagle Scout, Boy Scouts of America, *2001*

OTHER PROFESSIONAL EXPERIENCE

Consultant

- Thomas Edison State University – College equivalency review for Reactor Operator and Senior Reactor Operator licenses, INPO training for non-licensed operators and radiation protection technicians

Postdoctoral Fellow, School of Nuclear Engineering, Purdue University (2012 – 2014)

- Obtained over $700,000 in total funding for experimental research
- Implemented a rigorous review program for external reports; significant improvement in reports was noted by external research sponsors
- Developed dynamic solver for interfacial area transport and void transport equations based on the two-fluid model
- Directed development of droplet-capable conductivity probes for local measurements in annular flow

PUBLICATIONS: *https://scholar.google.com/citations?user=mhpWWK8AAAAJ&hl=en*

Ph.D. Thesis

J.P. Schlegel. 2012. Multidimensional two-phase flow structure in systems with large diameter. Doctoral dissertation, Purdue University.

M.S. Thesis

J.P. Schlegel. 2009. Experimental and analytical study of relative velocity and drag force in large diameter pipes. Masters Thesis. Purdue University.

Books and Book Chapters

1. Shen, X., J.P. Schlegel, S.W. Chen, S. Rassame, M.J. Griffiths, T. Hibiki and M. Ishii. **2014.** Flow Characteristics and Void Fraction Prediction in Large Diameter Pipes. Springer Briefs on Frontiers and Progress in Multiphase Flow I, Chapter 2. Springer, New York. DOI: 10.1007/978-3-319-04358-6_2. *21 Citations*
2. Schlegel, J.P. and P.K. Bhowmik. **2023.** Small Modular Reactor Designs and Deployment Challenges. Nuclear Power Reactor Designs: From History to Advances -- Structures, Systems, and Components, Chapter 14. Elsevier (under review).

Peer-Reviewed Journals

Citation	Impact Factor
1. Hong, S., S. Sharma, and J.P. Schlegel. **2023.** Comparison Study on Drag and Lift Interfacial Forces for Beyond Bubbly Flows in a Large Diameter Pipe Based Using STAR-CCM+ Code. International Journal of Heat and Mass Transfer. Under Review.	5.584
2. Hong, S., S. Sharma, and J.P. Schlegel. **2023.** CFD Study of Local Phase Distributions for Beyond Bubbly Flows in a Large Diameter Channel Using Two-Group Interfacial Area Transport Equation. Results in Engineering. Under Review	4.06
3. Gehrig, M.1, J.P. Schlegel, D. Youchison, A. Lumsdaine, and G. Mueller. **2023.** Multiple-Objective Tradeoff Analysis of Rib-Roughened Channel for Single Phase Cooling. Applied Thermal Engineering. Under Review.	6.465

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8. Meng, W., Z. Liu, J. Du, R. Steere, J.P. Schlegel, and K. Khayat. **2023**. Cement-Based Materials with Solid-gel Phase Change Materials for Improving Energy Efficiency of Building Envelope. Journal of Materials in Civil Engineering. In Press — 3.651
9. Bhowmik, P.[1], J.P. Schlegel, and S. Usman. **2023.** Condensation Scaled Experiments Using Pure Steam for Small Modular Reactor Safety Application. Applied Thermal Engineering. In Press. — 6.465
10. Swearingen, A.[1], J.P. Schlegel, and T. Hibiki. **2023.** Effect of Interfacial Area Modeling Method on Interfacial Drag Predictions for Two-Fluid Model Calculations in Large Diameter Pipes. Nuclear Engineering and Design 404. — 1.9
11. Bhowmik, P.[1], and J.P. Schlegel. **2023.** Multicomponent Gas mixture Parametric CFD Study of Condensation Heat Transfer in Small Modular Reactor System Safety. Experimental and Computational Multiphase Flow 5, pp. 15-28. — 2.290
12. Swearingen, A.[1], S. Drewry, J.P. Schlegel, and T. Hibiki. **2023.** Effect of Two-Group Void Fraction Covariance Correlations on Interfacial Drag Predictions for Two Fluid Model Calculations in Large Diameter Pipes. Experimental and Computational Multiphase Flow 5, pp. 221-231. — 2.290
13. Alhuzaymi, T., A.B. Alajo and J.P. Schlegel. **2022**. CFD Modeling of Hot Channel for Potential high Power Configuration of Missouri S&T Reactor. Transactions of the ANS 122(1), pp. 877-880. — 1.460
14. Bhowmik, P.[1], J.P. Schlegel, and S. Revankar. **2022.** State-of-the-art and review of condensation heat transfer for small modular reactor passive safety: experimental studies. International Journal of Heat and Mass Transfer 192, 122936. — 5.584
15. Hong, S.[1], and J.P. Schlegel. **2022.** Evaluation of S-gamma and AMUSIG Models for Solving Population Balance Equation of Coupled Two Fluid Model for Large diameter Channel. Transactions of the ANS 121 (1), pp. 1749-1752. — 1.460
16. Swearingen, A.[1], J.P. Schlegel, and T. Hibiki. **2022**. Sensitivity of Two Fluid Model Calculations to Two-Group Drift Flux Correlations Used in the Prediction of Interfacial Drag. Experimental and Computational Multiphase Flow. — 2.290
17. Bhowmik, P.[1], J.P. Schlegel, V. Kalra, S. Alam, S. Hong, and S. Usman. **2021**. CFD Validation of Condensation Heat Transfer in Scaled Down Small Modular Reactor Applications Part 2: Steam and Non-Condensable Gas. Experimental — 2.290

[1] Research advisee or co-advisee

and Computational Multiphase Flow.

18. Bhowmik, P.[1], J.P. Schlegel, V. Kalra, S. Alam, S. Hong, and S. Usman. **2021.** CFD Validation of Condensation Heat Transfer in Scaled Down Small Modular Reactor Applications Part 1: Pure Steam. Experimental and Computational Multiphase Flow. 2.290
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22. Bhowmik, P.K.[1], J.P. Schlegel, V. Kalra, C. Mills, and S. Usman. **2021.** Design of Condensation Heat Transfer Experiment to Evaluate Scaling Distortion in Small Modular Reactor Safety Analysis. Journal of Nuclear Engineering and Radiation Science 7(3): 031406. --
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52. Schlegel, J.P., S. Miwa, M. Griffiths, T. Hibiki, M. Ishii. **2014**. Development of Impedance Void Meter for Evaluation of Flow Symmetry. Annals of Nuclear Energy 63, pp. 525-532. 1.020
53. Schlegel, J.P., C. Macke, T. Hibiki, M. Ishii. **2013**. Modified Distribution Parameter for Churn-Turbulent Flow in Large Diameter Channels. Nuclear Engineering and Design 263, pp. 138-150. 0.972
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59. Schlegel, J.P., T. Hibiki and M. Ishii. **2010**. Development of a Comprehensive set of Drift-Flux Constitutive Models for Pipes of Various Hydraulic Diameters. Progress in Nuclear Energy 52(7), pp. 666-677. 1.119
60. Schlegel, J.P., P. Sawant, B. Ozar, S. Paranjape, T. Hibiki and M. Ishii. **2009**. Void Fraction and Flow Regime in Adiabatic Upward Two-Phase Flow in Large Diameter Pipes. Nuclear Engineering and Design 239, pp. 2864-2874. 0.972

Invited Presentations

1. Alajo, A., M. Gehrig, G. Gelles, J.P. Schlegel, J. Smith, and S. Usman. Nuclear Power: X-Rays to Energy. Panel Discussion. St. Louis Academy of Sciences. April 4, **2018**.
2. Schlegel, J.P., Nuclear Thermal Hydraulics Research at Missouri S&T. NPRE 596 Graduate Seminar. Nuclear, Plasma and Radiological Engineering, University of Illinois – Urbana-Champaign. December 2, **2014**.

Conference Proceedings (Peer-Reviewed)

1. Bhowmik, P., J.P. Schlegel and P. Sabharwall. **2023.** Assessment of RELAP5-3D Condensation Models for Small Modular Reactor Passive Safety. 20th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-20). Washington, D.C. August 20-25.
2. Bhowmik, P., J.P. Schlegel, R.M. Saeed, and S. Sharma. **2022.** CFD Validation and Assessment of Small Modular Reactor Passive Safety for Various Steam, Air, and Helium Mixtures. 19th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-19). Brussels, Belgium. March 6-11, 2022.
3. Hong, S., and J.P. Schlegel. **2022.** Modeling and Simulation of dispersed Two-phase flow using Two Group IATE with Start-CCM code. 19th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-19). Brussels, Belgium. March 6-11, 2022.
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7. Swearingen, A., J.P. Schlegel, and T. Hibiki. **2020.** Evaluation and Optimization of Void Fraction Prediction Accuracy. Japan-US Seminar on Two Phase Flow. Ann Arbor, MI. May 17-20.
8. Bhowmik, P.K., C. Mills, V. Kalra, J.P. Schlegel. **2020.** Scaled Facility Design for Condensation Heat Transfer Experiments for Small Modular Reactors. ICONE-28. Anaheim, CA. August 2-6.
9. Bhowmik, P.K., V. Kalra, S. Hong, and J.P. Schlegel. **2020.** CFD Study of Steam

Condensation Heat Transfer for Small Modular Reactors. ICONE-28. Anaheim, CA. August 2-6.

10. S. Hong and J.P. Schlegel. **2020.** CFD Analysis of S-Gamma Model Coupled with Two-Group Interfacial Area Transport Equation and AMUSIG Model for Large Diameter Pipe. ICONE-28. Anaheim, CA. August 2-6.
11. Zhao, Y., Y.C. Lin, J.P. Schlegel, M. Ishii, and J.R. Buchanan. **2019.** Bubble Nucleation Characteristics in Subcooled Boiling Flow for Pressure up to 600 kPa. Transactions of the ANS 121, pp. 1869-1871.
12. Hong, S.[1] and J.P. Schlegel. **2019.** Evaluation of S-Gamma and AMUSIG Models for Solving Poulation Balance Equation of Coupled Two-Fluid Model for Large Diameter Channel. Transactions of the ANS 121, pp. 1749-1752.
13. Alhuzaymi, T., A.B. Alajo, and J.P. Schlegel. **2019.** CFD Modeling of Hot-Channel for Potential High Power Configuration of Missouri S&T Reactor.
14. Al-Naseri, H.[1], J.P. Schlegel, and M. Al-Dahhan. **2019.** The Effect of the Presence of Internals on the Flow Regime in Industrial-Scale Bubble Column Reactor. AIChE Annual Meeting. Orlando, FL. November 10-15.
15. Al-Naseri, H.[1], J.P. Schlegel, and M. Al-Dahhan. **2019.** The Impact of Low Dynamic Liquid Levels on the Flow Pattern in Pilot Plant Bubble Column Reactor. AIChE Spring Meeting. New Orleans, LA. March 31-April 4.
16. Al-Naseri, H.[1], J.P. Schlegel, and M. Al-Dahhan. **2018.** The Effect of Solid Loading on Local Gas Holdup in Pilot Scale Bubble Column with Industrial Heat Exchanger Internal Structure. 13th International Conference on Gas-Liquid and Gas-Liquid-Solid Reactor Engineering (GLS-13). August 20-23.
17. Al-Naseri, H.[1], J.P. Schlegel, and M. Al-Dahhan. **2017**. Dynamic Liquid Level Effect on Bubble Properties in Industrial Bubble Column without Internals by Using Four-Point Optical Fiber Probe Technique. Proceedings of the 2017 AIChE Annual Meeting. Minneapolis, MN, USA. October 29-November 3.
18. Al-Naseri, H.[1], J.P. Schlegel, and M. Al-Dahhan. **2017**. The Impact of Slurry Concentrations on Bubble Properties in Pilot Scale Bubble Column with Industrial heat Exchanger Internal Structure of Fischer-Tropsch (FT) Synthesis. Proceedings of the 2017 AIChE Annual Meeting. Minneapolis, MN, USA. October 29-November 3.
19. Shen, X., J.P. Schlegel, T. Hibiki, and H. Nakamura. **2017**.Multi-Dimensional Gas-Liquid Two-Phase Flow in Vertical Large Diameter Channels. 2017 Japan-US Seminar on Two-Phase Flow Dynamics. Sapporo, Hokkaido, Japan. June 22-24.
20. Zhu, Q., X. Yang, J.P. Schlegel, Y. Liu, J.R. Buchanan, and M. Ishii. **2017**. Characterization of Transition from Churn-Turbulent to Annular Flows. 2017 Japan-US Seminar on Two-Phase Flow Dynamics. Sapporo, Hokkaido, Japan. June 22-24.
21. Kinoshita, I., T. Toshihide, J.P. Schlegel, and T. Hibiki. **2017**. Development of a New Drift Flux Model for Rod Bundle Geometries at Low Flow and Pressure Conditions (1) New Drift Flux Model Development and Validation. Proceedings of the 2017 Spring Annual Meeting of the Atomic Energy Society of Japen, Hiratsuka, Japan, March 27-29, **.**
22. Alnaseri, H.[1], A.J. Sultan, J.P. Schlegel and M.H. Al-Dahhan. **2016**. CFD Simulation for Bubble Column with and without Internals for Fischer-Tropsch Synthesis. Proceedings of the 2016 AIChE Annual Meeting. San Francisco, CA. November 13-18.
23. Zhu, Q., J.P. Schlegel, X. Yang, Y. Liu, J.R. Buchanan, and M. Ishii. **2016**. Local Measurement in Annular Flows Using a Two-Sensor Droplet-Capable Conductivity Probe.

Proceedings of the 2016 ANS Winter Meeting. Las Vegas, NV. November 6-10.

24. Sharma, S.L., T. Hibiki, M. Ishii, J.P. Schlegel, J.R. Buchanan, K.J. Hogan, and P.W. Guilbert. 2015. Assessment of an Interfacial Shear Term for Adiabatic Dispersed Air-Water Two-Phase Flow with the Two-Fluid Model. Proceedings of the 15th International Topical Meeting on Nuclear Reactor Thermal Hydraulics. Chicago, August 30-September 4.
25. Sharma, S.L., C.S. Brooks, J.P. Schlegel, Y. Liu, T. Hibiki, M. Ishii, and J.R. Buchanan. Turbulence-induced Bubble Collision Force Model Development and Assessement for Adiabatic Dispersed Air-Water Two-Phase Flow with the Two-Fluid Model. Proceedings of the 15th International Topical Meeting on Nuclear Reactor Thermal Hydraulics. Chicago, August 30-September 4.
26. Schlegel, J.P., T. Hibiki, X. Shen, S. Appathurai and H. Subramani. **2015**. Evaluation of Interfacial Area Transport Equation in Coupled Two-Fluid Model Computation. Proceedings of the 15th International Topical Meeting on Nuclear Reactor Thermal Hydraulics, Chicago, IL. August 30 – September 4.
27. Schlegel, J.P., T. Hibiki and M. Ishii. **2015**. Characteristics of Two-Phase Flows in Large Diameter Channels. Proceedings of the Japan-US Seminar on Two-Phase Flow Dynamics. May 10 – 15.
28. X. Yang, J.P. Schlegel, Y. Liu, S. Paranjape, T. Hibiki and M. Ishii. **2015**. Prediction of Interfacial Area Transport in a Scaled 8x8 BWR Rod Bundle. Proceedings of the Japan-US Seminar on Two-Phase Flow Dynamics. May 10 – 15.
29. Schlegel, J.P., T. Hibiki, M. Ishii, X. Shen and S. Appathurai. **2014.** Implementation of Two-Group Interfacial Area Transport in a One-Dimensional Computational Environment. Proceedings of the International Topical Meeting on Advances in Thermal Hydraulics 2014 (ATH '14). Reno, Nevada, USA.
30. Clark, C., M. Griffiths, S.W. Chen, J.P. Schlegel, T. Hibiki, M. Ishii, T. Ozaki, I Kinoshita and Y. Yoshida. **2014.** Drift-Flux Correlation for a Rod Bundle Geometry. Proceedings of the International Topical Meeting on Advances in Thermal Hydraulics 2014 (ATH '14). Reno, Nevada, USA.
31. Schlegel, J.P., S. Miwa, S.W. Chen, T. Hibiki and M. Ishii. **2011**. Interfacial Area Transport Equation Evaluation Methodology for Large Diameter Pipes. Proceedings of the 14th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-14). Toronto, Ontario, Canada. *1 citation*
32. Yang, X., J.P. Schlegel, S. Paranjape, Y. Liu, S.W. Chen, T. Hibiki and M. Ishii. **2011**. Interfacial Area Transport in Two-Phase Flows in a Scaled 8x8 Rod Bundle Geometry at Elevated Pressures. Proceedings of the 14th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-14). Toronto, Ontario, Canada. *3 citations*
33. Schlegel, J.P., T. Hibiki and M. Ishii. **2009**. Void Fraction Measurement and Drift-Flux Modeling of Vertical Upward Two-Phase Flow in a Large Diameter Channel. Proceedings of the 13th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-13).
34. P. Sawant, J.P. Schlegel, S. Paranjape, B. Ozar, T. Hibiki and M. Ishii. **2008**. Flow regime identification in large diameter pipe. Proceedings of the 16th International Conference on Nuclear Engineering (ICONE-16), Orlando, Florida, USA, pp. 341-351.

GRANTS AND CONTRACTS RECIEVED

Training and Support for Electrical Resistivity and Impedance Probe Assembly and Use
PI: Dr. Joshua Schlegel
Period: January 20, 2023 – January 31, 2024
Total Budget: $13,651

Procurement of Spare Parts for Instrumentation Channels, Electronics Test Equipment, and Power Uprate Study at the Missouri S&T Reactor
PI: Dr. Joseph Graham, co-PI: Dr. Joshua Schlegel (12%)
Period: October 1, 2022 – September 30, 2023
Total Budget: $250,000 (US DOE)
Contribution: Thermal hydraulic analyses for potential power uprate

Using Computational and Analytical Methods to Optimize High Heat Flux Component Thermal Performance in Magnetic Confinement Fusion Reactors
PI: Dr. Joshua P. Schlegel
Project Period: March 15, 2021 – March 14, 2021
Total Budget: $100,241 (US DOE)

Undergraduate Scholarships in Nuclear Engineering at Missouri S&T (2020-2022)
PI: Prof. Joshua Schlegel (60%), co-PI: Shoaib Usman, Prof. Carlos H. Castano
Period: January 1, 2021 – December 31, 2022
Total Budget: $200,000 (US NRC)
Contribution: Primarily responsible for preparing proposal and reports; chair selection committee.

Computational Fluid Dynamics for Fusion Component Cooling
PI: Prof. Joshua Schlegel
Period: August 15, 2020 – December 31,2020
Total Budget: $11,680 (US DOE)

Undergraduate Scholarships in Nuclear Engineering at Missouri S&T (2019-2021)
PI: Prof. Joshua Schlegel (60%), co-PI: Prof. Hyoung-Koo Lee, Prof. Carlos H. Castano
Period: August 1, 2018 – July 31, 2020
Total Budget: $200,000 (US NRC)
Contribution: Primarily responsible for preparing proposal and reports; chair selection committee.

Graduate Fellowships in Nuclear Engineering at Missouri S&T 2019-2024
PI: Prof. Ayodeji Alajo, co-PI: Prof. Joseph Graham, Prof. Joshua P. Schlegel (30%)
Period: August 1, 2019 – June 29, 2024
Total Budget: $400,000 (US NRC)
Contribution: Serve on selection committee; assist with preparation of reports

Overhead Crane Installation and Enhancement of Distance Learning at Missouri S&T Reactor
PI: Prof. Ayodeji Alajo; co-PI: Prof. Joshua Schlegel, Prof. Hyoung-Koo Lee, Prof. Xin Liu, Prof. Shoaib Usman, Prof. Joseph Graham
Project Period: October 1, 2018 – September 30, 2019
Total Budget: $250,000 (US DOE)

Undergraduate Scholarships in Nuclear Engineering at Missouri S&T (2018-2020)
PI: Prof. Hyoung-Koo Lee, co-PI: Prof. Joshua Schlegel (50%)
Period: August 1, 2018 – July 31, 2020

Total Budget: $200,000 (US NRC)
Contribution: Serve on selection committee; assist with preparation of reports

Radiation Response of Phase Change Materials for Space and Nuclear Applications
PI: Prof. Joshua Schlegel
Project Period: April 1, 2018 – June 30, 2018
Total Budget: $8,500 (MRC Seed Funding)

Undergraduate Scholarships in Nuclear Engineering at Missouri S&T (2017-2019)
PI: Prof. Hyoung-Koo Lee, co-PI: Prof. Joshua Schlegel
Period: August 1, 2017 – July 31, 2019
Total Budget: $200,000 (US NRC)
Contribution: Assist with preparation of proposal and reports. Serve on selection committee.

Development and Testing of the DCCP-4 and its Measurement Principle
PI: Dr. Mamoru Ishii, Purdue University (75%), co-PI: Dr. Joshua Schlegel, Missouri S&T
Period: March 1, 2017 – September 29, 2018
Total Budget: $8,000 (subcontract)
Contribution: Data analysis for performance comparison with existing measurement techniques and technical review of all publications.

Facility Integration for Synthesis and Testing of Nano-Radioisotopes at Missouri S&T
PI: Prof. Carlos H. Castaño Giraldo; co-PI: Dr. Xin Liu (30%), Dr. Joshua Schlegel (30%)
Period: --
Total Budget: $19,000 (Innovation at Missouri S&T)

Undergraduate Scholarships in Nuclear Engineering at Missouri S&T - III
PI: Prof. Hyoung-Koo Lee, co-PI: Prof. Joshua Schlegel (30%)
Period: August 1, 2016 – July 31, 2018
Total Budget: $200,000 (US NRC)
Contribution: Primarily responsible for preparing proposal and reports; serve on selection committee.

Development of Improved Drift-Flux Model for Rod Bundles at Moderate Pressures
PI: Prof. Joshua P. Schlegel
Period: November 15, 2015 – February 5, 2016
Total Budget: $30,000 (Institute of Nuclear Safety Systems, Inc.)

Undergraduate Scholarships in Nuclear Engineering at Missouri S&T - II
PI: Prof. Hyoung-Koo Lee, co-PI: Prof. Joshua Schlegel (30%)
Period: August 1, 2015 – July 31, 2017
Total Budget: $200,000 (US NRC)
Contribution: Primarily responsible for preparing proposal and reports; serve on selection committee.

Experimental Validation of Models and Simulations in Nuclear Systems
PI: Prof. Joshua P. Schlegel
Period: February 1, 2015 – January 31, 2018
Total Budget: $55,000 (University of Missouri Research Board)

Graduate Fellowships in Nuclear Engineering at Missouri S&T 2014-2021
PI: Prof. Hyoung-Koo Lee, co-PI: Prof. Joshua P. Schlegel
Period: August 1, 2014 – June 29, 2021
Total Budget: $400,000 (US NRC)

Undergraduate Scholarships in Nuclear Engineering at Missouri S&T

PI: Prof. Hyoung-Koo Lee, co-PI: Prof. Joshua Schlegel (40%)
Period: August 1, 2014 – July 31, 2016
Total Budget: $200,000 (US NRC)
Contribution: Primarily responsible for preparing proposal and reports; serve on selection committee.

Condensation Heat Transfer Experiment and Scaling
Co-PIs: Prof. Shaoib Usman (60%), Prof. Joshua P. Schlegel (40%)
Project Period: August 1, 2014 – June 30, 2015
Total Budget: $90,000 (SMR Research and Education Consortium)
Contribution: Primarily responsible for design and construction of test facility, performing experiments, and preparation of final report

Interfacial Area Transport Study in Gas-Dispersed Flow up to the Churn-Turbulent to Annular Flow Regime Transition
PI: Prof. Mamoru Ishii, Purdue University (75%); Prof. Joshua P. Schlegel, Missouri S&T (25%)
Project Period: August 1, 2014 – August 31, 2018
Total Budget: $619,000 (Bechtel Bettis Marine Propulsion)
Subcontract Budget: $33,000 (PI: Prof. Joshua P. Schlegel, Missouri S&T)
Contribution: Provide technical advice, primarily responsible for preparation of technical reports

Code Development for the Prediction of Bubble Coalescence and Breakup Rates in the Churn-Turbulent Flow Regime, Phase II
PI: Prof. Takashi Hibiki, Purdue University (25%); Co-PI: Prof. Joshua P. Schlegel, Missouri S&T (75%)
Project Period: April 1, 2014 – December 31, 2014
Total Budget: $120,000 (Chevron Energy Technology Company)
Subcontract Budget: $46,500 (PI: Prof. Joshua P. Schlegel, Missouri S&T)
Contribution: Performed all computational analysis and prepared final technical report

Code Development for the Prediction of Bubble Coalescence and Breakup Rates in the Churn-Turbulent Flow Regime
PI: Prof. Takashi Hibiki, Purdue University (25%); Co-PI: Dr. Joshua P. Schlegel (50%), Co-PI: Prof. Mamoru Ishii (25%)
Project Period: April 1, 2013 – December 31, 2013
Total Budget: $100,000 (Chevron Energy Technology Company)
Contribution: Developed MATLAB code, performed preliminary computational analysis and prepared final technical reports

Additional Proposals Submitted

Graduate Fellowships in Nuclear Engineering at Missouri S&T (2022-2026)
PI: Ayodeji Alajo, co-PI: Dr. Joshua P Schlegel (30%)
Project Period: July 1, 2022 – June 30, 2026
Total Budget: $400,000 (US NRC)
Status: Not Funded

Undergraduate Scholarships in Nuclear Engineering at Missouri S&T (2022-2024)
PI: Dr. Joshua P. Schlegel (40%), co-PI: Dr. Syed Alam, Dr. Carlos Castano, Dr. Shoaib Usman

Project Period: July 1, 2022 – June 30, 2024
Total Budget: $200,000 (US NRC)
Status: Not Funded

Experimental Evaluation of Scaling Distortion
PI: Dr. Joshua P. Schlegel
Project Period: September 30, 2020 – September 29, 2022
Total Budget: $331,690 (US NRC)
Status: Not Funded

High Pressure Boiling and Condensation Study
PI: Dr. Joshua P. Schlegel, co-PI: Dr. Muthanna Al-Dahhan
Project Period: September 30, 2020 – September 29, 2022
Total Budget: $499,858 (US NRC)
Status: Not Funded

Oxygen Ingress in High Temperature Gas Reactors
PI: Dr. Joshua P. Schlegel, co-PI: Dr. Shaoib Usman, Dr. Muthanna Al-Dahhan
Project Period: October 1, 2019 – September 30, 2022
Total Budget: $800,000 (Department of Energy)
Status: Not Funded

Nanosurface Etched Wire-Wrapped Heat Exchanger
PI: Dr. Joshua P. Schlegel, co-PI: Dr. Joseph Smith
Project Period: October 1, 2019 – September 30, 2022
Total Budget: $800,000 (Department of Energy)
Status: Not Funded

Sustainable Building with EMPaLA-G-doped Eco-SCC
PI: Dr. Joshua P. Schlegel, co-PI: Dr. Kamal Khayat, Dr. Weina Meng
Project Period: September 1, 2019 – August 31, 2022
Total Budget: $306,118
Status: Not Funded

CAREER: Effect of Radiation Damage on Organic Phase Change Materials
PI: Dr. Joshua P. Schlegel
Project Period: January 1, 2019 – December 31, 2024
Total Budget: $593,665
Status: Not Funded

Interfacial Area Transport Model Optimization
PI: Dr. Joshua Schlegel
Project Period: January 1, 2018 – December 31, 2018
Total Budget: $80,000 (Bettis Atomic Power Laboratory)
Status: Not Funded
Contribution: Prepare Pareto optimization software and analyze empirical coefficients in key bubble coalescence and breakup models

CMMI: Enhancing energy efficiency in building systems through PCM-doped concrete
PI: Dr. Joshua P. Schlegel (50%); co-PI: Dr. Weina Meng, Dr. Kamal Khayat (50%)
Project Period: May 1, 2018 – April 30, 2019
Total Budget: $375,000
Status: Not Funded
Contribution: Preparation of phase change materials, evaluation of thermal properties, and

overall management of project.

Advancing Two-Phase Simulation (RELAP-7) for Light Water Reactors by a Novel Integration of Advanced Measurement Techniques Implemented in a Represented Core Geometry

PI: Dr. Muthanna Al-Dahhan; Co-PI: Dr. Joshua Schlegel (20%), Dr. Marc-Oliver Delchini (ORNL), Neven Ali (UNM), Anca Hatman (AREVA), John Strumpell (AREVA)

Project Period: October 1, 2018 – September 30, 2021

Total Budget: $800,000 (Department of Energy)

Status: Not Funded

Contribution: Scaling and design of 5x5 rod bundle test facility for advanced instrumentation and analysis of experimental results.

Quantitative Analysis of Xenon Bubble Behavior in Liquid Sodium using Digital X-Ray Fluoroscopy

PI: Dr. Joshua Schlegel (45%); Co-PI: Dr. Hyoung-Koo Lee (45%), Dr. Fateme Rezaei (10%)

Project Period: October 1, 2018 – September 30, 2021

Total Budget: $800,000 (Department of Energy)

Status: Not Funded

Contribution: Design liquid sodium recirculation loop to operate at 500ºC; Oversee construction and operation of loop; Model bubble formation in liquid sodium; Manage regular reporting

Evaluating Suitability of Phase Change Materials for Passive Nuclear Reactor Safety

PI: Dr. Joshua Schlegel; co-PI: Dr. Muhammed Yousaf (Purdue University), Dr. Mamoru Ishii (Purdue University), Dr. Shanbin Shi (University of Michigan), Dr. Reyad Sawafta (Phase Change Energy Solutions)

Project Period: October 1, 2018 – September 30, 2021

Total Budget: $800,000 (Department of Energy)

Status: Not Funded

Contribution: Coordinate efforts across multiple partners; Scaling analysis and experimental design; Evaluation and analysis of data; Manage regular reporting

Development of Advanced 3-D Modeling Capability for RELAP-7

PI: Dr. Dean Wang (UMass-Lowell); co-PI: Dr. Joshua Schlegel, Dr. Robert Salko (ORNL), Dr. Ling Zou (INL), Dr. Wenfeng Liu (ANATECH Corp.)

Project Period: October 1, 2018 – September 30, 2021

Total Budget: $800,000 (Department of Energy); Missouri S&T: $180,000

Status: Not Funded

Contribution: Model evaluation, selection, and/or development for multiphase subchannel analysis and computational fluid dynamics

Thermal Fluids Laboratory for Nuclear Engineers

PI: Dr. Joshua P. Schlegel

Project Period: September 1, 2018 – August 31, 2019

Total Budget: $78,000 (Department of Energy)

Status: Not Funded

CAREER: Effect of Nanoparticle Alignment and Radiation Damage on Phase Change Material Performance

PI: Dr. Joshua Schlegel

Project Period: January 1, 2018 – December 31, 2023

Total Budget: $630,000 (Department of Energy)

Status: Not Funded

Evaluating Suitability of Phase Change Materials for Passive Nuclear Reactor Safety

PI: Dr. Joshua Schlegel; co-PI: Dr. Mamoru Ishii (Purdue University), Dr. Reyad Sawafta (Phase Change Energy Solutions)
Project Period: October 1, 2017 – September 30, 2020
Total Budget: $400,000 (Department of Energy)
Status: Not Funded

Transient Analysis of RCCS and Computational Tool Validation for Natural convection

PI: Dr. Shoaib Usman; co-PI: Dr. Joshua Schlegel; Dr. Mike Corradini, University of Wisconsin-Madison; Dr. Darius Lisowski, ANL; Dr. Vivek Agarwal, INL; F. Shahrokhi, AREVA.
Project Period: October 1, 2016 – September 30, 2019
Total Budget: $800,000 (Department of Energy)
Status: Not Funded

Condensation Heat Transfer in Small Modular Reactor Containments

PI: Dr. Joshua Schlegel; co-PI: Dr. Shoaib Usman
Project Period: October 1, 2015 – September 30, 2018
Total Budget: $400,000 (Department of Energy)
Status: Not Funded

Bubble Plume Experiments for Validation of CFD Analyses

PI: Dr. Joshua Schlegel; co-PI: Dr. Takashi Hibiki, Purdue University; Dr. Joseph Smith, Missouri S&T
Project Period: October 1, 2015 – September 30, 2018
Total Budget: $800,000 (Department of Energy)
Status: Not Funded

NSTF Experiments for Reactor Cavity Cooling System CFD Validation

PI: Dr. Joshua Schlegel; co-PI: Dr. Takashi Hibiki, Purdue University; Dr. Vivek Agarwal, Idaho National Laboratory
Project Period: October 1, 2015 – September 30, 2018
Total Budget: $800,000 (Department of Energy)
Status: Not Funded

GRADUATE STUDENT SUPERVISION

Ph.D. Degrees Completed:

Date	Student	Thesis/Dissertation Title	Current Position
May 2023	Sungje Hong	Validation of CFD Models for Interfacial Area Transport in Large Diameter Channels	Engineer Framatome
May 2023	Alexander Swearingen	Sensitivity of Numerical Modeling of Multiphase Hydrodynamics to Constitutive Models	Research Scientist Idaho National Laboratory
December 2022	Monica Gehrig	Using Computational Methods to optimize High Heat Flux Component Thermal Performance in Magnetic Confinement Fusion Reactor Research	DOE Postdoctoral Fellowship Fusion Energy Sciences Oak Ridge National Laboratory

August 2021	Ryan Steere	Radiation Effects on Phase Change Material Performance	Research Scientist Bettis Atomic Power Laboratory
August 2021	Palash Bhowmik	Condensation Heat Transfer Rates in Passive Safety Systems	Research Scientist Idaho National Laboratory
August 2019	Hayder Al-Naseri[4,5]	Bubble Dynamic Properties in Low Height Bubble and Slurry Bubble Column with Internals for Fischer-Tropsch Synthesis	
May 2019	Hiralkumar Patel[6]	Experimental Investigation of Liquid Contact in the Developing Post-Dryout CHF Flow Boiling Regime Using Surface Mounted Thermistors	Research Scientist Naval Nuclear Laboratory
August 2018	Chandller Mills	Measurement of Interfacial Area Concentration	
May 2018	Rami Saeed	Advances in Phase Change Materials for Thermal Energy Storage	Research Scientist Idaho National Laboratory.

M.S. Degrees Completed:

Date	Student	Thesis/Dissertation Title	Current Position
August 2021	William McCauley	--	Reactor Operator Idaho National Laboratory
May 2021	Jacob Ford	--	
May 2021	Murat Tuter	Severe Accident Analysis Using ATHLET-CD	Safety Engineer
May 2017	Varun Kalra	CFD Validation and Scaling of Condensation Heat Transfer	Research Scientist Phase Change Energy Solutions, Inc.
May 2017	Raymond Fanning[6]	W-SMR Passive Safety Natural Convection Heat Exchanger	Idaho National Laboratory
May 2016	Rami Saeed	Thermal Characterization of Phase Change Materials for Thermal Energy Storage	Research Scientist Idaho National Laboratory.

Degrees in Progress

Degree	Student	Thesis/Dissertation Topic
Ph.D.	William McCauley	Sensitivity of Numerical Modeling of Multiphase Heat Transfer to Constitutive Models
M.S.	Emin Ozdem	

[4] Student in Chemical Engineering
[5] Co-advisee

COURSES DEVELOPED AND TAUGHT

Undergraduate Courses

Year Developed	Course Number and Title	Taught	Overall Effectiveness (4.0 scale)[6]
--	NE 3221: Reactor Fluid Mechanics	Fall 2015 - Present	3.52
--	NE 3223: Reactor Heat Transfer	Spring 2016 - Present	3.80
2015	NE 4257: Two-Phase flow in Energy Systems	Spring 2015 - Present	4.00
2019	NE 4281: Probabilistic Risk Assessment	Fall 2019 - Present	3.50
--	NE 4496: Nuclear Systems Design I	Fall 2015-Fall 2019	3.85

Graduate Courses

Year Developed	Course Number and Title	Taught	Overall Effectiveness (4.0 scale)[7]
2015	NE 5257: Introduction to Nuclear Thermal-Hydraulics	Fall 2015 - Present	3.75
2019	NE 5281: Probabilistic Risk Assessment I	Fall 2019 - Present	3.82
2016	NE 6257: Advanced Nuclear Thermal-Hydraulics	Fall 2014 - Present	3.75

PROFESSIONAL SOCIETIES

American Nuclear Society, *2005-Present*

Thermal Hydraulics Division, *2014 – Present*

Atomic Energy Society of Japan, *2015 – 2019*

Thermal Hydraulics Division

PROFESSIONAL SERVICE

International Service

Editorial Board

Experimental and Computational Multiphase Flow

Guest Editor

Frontiers in Energy Research: Advancements in Nuclear and Irradiation Experiments

Progress in Nuclear Energy: Tests for Reactor Licensing

Energies: Frontiers in Thermal Energy Storage and Heat Exchange

Reviewer

Annals of Nuclear Energy, Applied Thermal Engineering, ASME Journal of Fluids Engineering, Chemical Engineering Science, Energies, Experimental Thermal and Fluid Science, Fluids, International Journal of Heat and Fluid Flow, International Journal of Heat

[6] Most recent evaluation only

and Mass Transfer, International Journal of Multiphase Flow, International Journal of Thermal Science, Journal of Energy Research, Journal of Nuclear Science and Technology, Nuclear Engineering and Design, Nuclear Science and Engineering, Sensors, The Open Chemical Engineering Journal, Processes, Progress in Nuclear Energy,

18th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-18)
August 18-23, 2019
Reviewer

27th International Conference on Nuclear Engineering (ICONE 27)
May 19-24, 2019
Reviewer

26th International Conference on Nuclear Engineering (ICONE 26)
July 22-26, 2018
Reviewer, 3 papers

17th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-17)
September 3 – 8, 2017
Reviewer

25th International Conference on Nuclear Engineering (ICONE 25)
May 14-18, 2017
Reviewer

11th International Topical Meeting on Nuclear Thermal Hydraulics, Operation and Safety (NUTHOS-11),
October 9-13, 2016
Reviewer

2016 International Congress on Advances in Nuclear Power Plants (ICAPP-16)
April 17-20, 2016
Reviewer

16th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-16)
August 30 – September 4, 2015
Reviewer; Session Chair

Missouri S&T

Nuclear Science Design Team Advisor, *2015 – Present*
Women in Nuclear Advisor, *2019 – Present*
CERTI Advisory Committee, *2016*
Resources subcommittee - Deliberate on resources that CERTI could provide that would enhance the teaching mission of the university, deliver recommendations to CERTI
Discipline Specific Curriculum Committee, *2019-Present*
Engagement and Outreach Committee, *2020-Present*
Doshi Professor of Chemical and Biochemical Engineering search committee, *2021*

Department of Nuclear Engineering and Radiation Science

Associate Chair - Academics, *2017 – Present*
Nuclear Engineering NRC Scholarship Committee, *2014 – Present*
Mining and Nuclear Engineering Chair Search Committee, *2015-2016*
Nuclear Engineering and Radiation Science Chair Search Committee, *2020-2022*

COMMUNITY SERVICE

Gear City Church, Rolla, MO, *2017 – Present*
Lighting Designer and Technician
Lafayette Civic Theater; Lafayette, IN, *2012-2014*
Lighting Designer and Master Electrician
HorrorHound Weekend; Indianapolis, IN, *2010-2014*
Volunteer Coordinator

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APPENDIX B – SELECTED TEACHING EVALUATION COMMENTS

Fall 2022:

I'd say that his greatest strength is the thoroughness of the Canvas page. There are supplemental lectures, worked out problems, and reference pages easily available. Usually when I'm stuck on a problem and the lecture wasn't quite enough to understand I have to hunt around the internet for examples; in this class about 80% of the times when I was in that situation the Canvas page was enough to help. The collaborative challenge problems were also helpful for learning to apply the information.

He is very transparent with everything he is doing, he is a very fair grader, and he is always making sure the students are learning the material in class. He is willing to take breaks from his lecture to explain things when people look confused.

The instructor spoke in a way that was easy to understand. His understand of the material was strong.

It was more of a hands on class instead of just sitting and listening to lecture. Learned so much more from class time.

You understand the subject matter so well that the way you convey it, it sounds so simple and easy to understand. You are also great at keeping the workload consistent to where I can track my progress and understand how I am doing.

Creates a very structured set of in class activities that allow students to learn in groups. Instructor gives really constructive feedback when working on solutions and is personable so not an intimidating moment.

I feel that Dr. Schlegel wasn't always the best at completely answering questions -- not because he doesn't know the answer but perhaps because he could not understand how someone doesn't already know the answer to the question being asked.

Knowledgeable about many important subjects, helpful in providing resources if outside help is needed. Provides adequate feedback to explain poor grades.

I think Dr. Schlegel did a great job of talking us through some of the concepts encountered in design that we haven't really seen elsewhere (e.g. ethics, computational modeling). I also really appreciated the class schedule, and I felt that I got a lot out of the lecture/presentation schedule. It was helpful to see the progress of other groups and to use that as both inspiration and a progress check for your own group. I also think team evaluations are a great way to encourage group participation and reward harder workers.

Knows what he is talking about. During weekly presentations, gives good advice and criticism really helping you figure out what is going wrong and what is going right.

This instructor uses technology more effectively than any other I have. His recording of lectures through zoom allows students to actually pay attention to the lecture instead of trying to write everything down to make sure they can complete the homework.

More detailed references in PowerPoint slides. I could allows find the source that was being referenced.

Spring 2023:

Always in class on time. Cares about the students and constantly asks if there are any improvements that he can make to the class. Great at describing and showing work on the board. Class structure is very based around doing work with groups and having the professor help and push you in the right direction. Very hands on.

Greatly understands the course material and communicates it well. Asks for feedback to better improve the course for the future and then takes those into consideration for the next year.

One of the best teachers in the nuclear department. I learn so much better with his teaching style with challenge problems than just a day to day lecture. More teachers should teach like him.

The way his class is structured is very helpful. The challenge problems are very helpful for the tests and homeworks. He is always open to feedback and available for help after class. Overall amazing teacher!

The course is designed as to guarantee you understand the material very well by the test happens. Dr. Schlegal is good at using intuitive examples while teaching to demonstrate the concept in question.

Vey organized canvas page Good with getting experience with the problems on our own

Very flexible about teaching methods and open to suggestions.

He has one of the best canvas pages I have ever seen; a lot of information available to you and easy to access. He knows his stuff and knows what he expects from his students.

Homework sometimes takes 8 or more hours to complete especially the ones with 6 questions, sometimes it is extremely hard to keep up with it. I also feel like I could get a much higher test score if I just had more time to complete it or less problems.