Mustafa Hadj-Nacer, Ph.D.

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RESEARCH INTEREST/EXPERIENCE

- **Porous Media Two-Phase Flow and Phase Change**
  - Develop an open-source CFD code in OpenFOAM to model flow and phase-change in the porous media of loop heat pipe operating in micro-gravity. An experimental apparatus is developed to benchmark the numerical model.
- **Transportation and Storage of Used Nuclear Fuel**
  - Develop full-scale numerical models to simulate used nuclear fuel canisters/casks subjected to normal and accident conditions of storage and transportation. Small scale experiments are developed to validate the model.
- **Rarefied Gas Flow**
  - Develop experimental and numerical models to study rarefied heat transfer in micro/nano channels and larger systems.

The detail of my research interest and experience is given below.

APPOINTMENTS

Research Assistant Professor, University of Nevada, Reno, NV	2017 – Present
Research Scientist, University of Nevada, Reno, NV	2014 – 2017
Postdoctoral Research Associate, University of Nevada Reno, NV	2013 – 2014
Graduate Research Assistant, Aix-Marseille University, France	2008 – 2012
Intern at INFICON, Blazers, Liechtenstein	2011
Intern at University of Udine, Udine, Italy	2011

EDUCATION

University of Aix-Marseille, France

Ph.D. Mechanical Engineering   *2009- 2012*

Dissertation: Tangential Momentum Accommodation Coefficient in Microchannels with Different Surface Materials (Measurements and Simulations).

M.Sc. Mechanical Engineering   *2008-2009*

Thesis: Thermal Transpiration (Creep) Effect in Microtubes.

École Nationale Polytechnique, Algeria

B.Sc. Mechanical Engineering   *2003-2008*

Thesis: Numerical Study of Smoke Propagation in a Case of Fire in an Underground Rail Station.

FUNDED PROJECTS

- University of Nevada Reno, College of Engineering Dean's Office (Internal Funding), $11,700 (2018) "Equipment Enhancement for ME 322 Lab", **Hadj Nacer, Mustafa** (sole PI).

- DoE/Nuclear Energy University Program (NEUP), $399,754 (2017) "Development and Experimental Benchmark of Computational Models to Predict Cladding Temperature and Vapor Removal from UNF Canisters during Drying Operations." Greiner, Miles (PI, $250,000) and **Hadj Nacer, Mustafa (Co-PI, $149,754)**.
- Nevada NASA EPSCoR, $6,370 (2017) "NASA EPSCoR Travel and Workshop Opportunity", **Hadj Nacer, Mustafa** (sole PI).
- University of Nevada Reno, College of Engineering Dean's Office (Internal Funding), $29,975 (2017) "Repair and Construction of New Wind Tunnels for ME 322 Lab", **Hadj Nacer, Mustafa** (sole PI).
- Nevada NASA EPSCoR, $3,806 (2016)"Summer 2016 travel to NASA JPL", **Hadj Nacer, Mustafa** (sole PI).

HONORS AND AWARDS

- Marie-Curie Fellowship Grant (Seventh Framework Program).   2009
- MED CAP Accueil Scholarship.   2008

PROFESSIONAL CERTIFICATIONS

- Certificate in Effective Instruction, Association of College and University Educators (ACUE) and the American Council on Education (ACE).   2019
- Application of the ASME Code to Radioactive Material Packaging/Cask, U.S.DoE.   2014
- State Mechanical Engineer, Algeria (#05/Mec/08).   2008

PUBLICATIONS

Journal Papers (Published)
1. Maharjan, D., **M. Hadj-Nacer**, and M. Greiner, (2020) "Temperature Measurement of a Heated Rod Array within a Square Cross Section Enclosure Filled with Dry Rarefied Helium," International Journal of Heat and Mass Transfer, 148, 119033.
2. Perrier, P., **M. Hadj-Nacer**, J.G. Méolans, and I. Graur, "Measurements and modeling of the gas flow in a microchannel: influence of aspect ratios, surface nature and roughnesses," Microfluidics and Nanofluidics (accepted).
3. D. Maharjan, **Hadj-Nacer, M.**, and M. Greiner, (2018) "Experimental Validation of Heat Transfer Simulations for a Vertical Heated Rod Array within a Square-Cross-Section, Helium-Filled Isothermal Enclosure," *Journal of Thermal Science and Engineering Application*, 10, p. 021007.
4. **Hadj-Nacer, M.**, D. Maharjan, M. T. Ho, S. K. Stefanov, I. Graur and M. Greiner, (2017) "Continuum and kinetic simulations of Heat Transfer trough Rarefied Gas in Annular and Planar Geometries in the Slip Regime," *Journal of Heat Transfer,* 139(4), 042002.
5. **Hadj-Nacer, M.,** E. T. Manzo, M. T. Ho, I. Graur and M. Greiner, (2016) "Effects of Gas Rarefaction on Used Nuclear Fuel Cladding Temperatures during Vacuum Drying". *Nuclear Technology Journal* 194, 3, pp: 387-399.
6. **Hadj-Nacer, M.,** I. Graur, P. Perrier, J. G. Méolans and M. Wüest, (2014) "Gas Flow through Microtubes with Different Internal Surface Coatings", *Journal of Vacuum Science & Technology A* 32, 021601.
7. Méolans, J. G., **M. Hadj Nacer,** M. Rojas, P. Perrier and I. Graur, (2012) "Effects of two transversal finite dimensions in long microchannel: Analytical approach in slip regime". *Phys. Fluids* 24, 112005.
8. **Hadj-Nacer, M.,** I. Graur, P. Perrier, J. G. Méolans and M. Wüest, (2012) "Experimental Study of the Gas Flows Through Channels with Circular Cross Sections". *Journal of Physics: Conference Series* 362.

9. **Hadj-Nacer, M.,** I. Graur, P. Perrier, (2012) "Mass Flow Measurement Through Rectangular Microchannel From Hydrodynamic to Near Free Molecular Regimes". *La Houille Blanche Journal* 4, pp. 49-54.

Journal Papers (Submitted)

1. Maharjan, D., **M. Hadj-Nacer**, and M. Greiner, "Implementation and Experimental Validation of a Computational Model to Predict Temperatures and Heat Transfer of a Square Array of Heated Rods Enclosed in a Pressure Vessel Filled with Rarefied Dry Helium," International Journal of Heat and Mass Transfer (submitted).

Peer-reviewed Conference Papers

1. Higley, M., M. Hadj-Nacer, and M. Greiner, (2019) "Effect of the Thermal Expansion of the Used Nuclear Fuel Cask's Basket on Temperature during Vacuum Drying," ANS Winter Meeting, Washington, DC.
2. Zampella, C., Lane, M., M. Hadj-Nacer, and M. Greiner, (2019) "Measurement of the Thermal Accommodation Coefficient between Helium and a Stainless Steel Surface," Proceedings of the 19th International Symposium on the Packaging and Transportation of Radioactive Materials (PATRAM), New Orleans, LA.
3. Higley, M., M. Hadj-Nacer, and M. Greiner, (2019) "Temperature Prediction of a TN-32 Cask with Non-Concentric Basket Subjected to Vacuum Drying," Proceedings of the 19th International Symposium on the Packaging and Transportation of Radioactive Materials (PATRAM) August 4-9, 2019, New Orleans, LA.
4. Higley, M., M. Hadj-Nacer, and M. Greiner, (2018) "Temperature Prediction of a TN-32 Canister Subjected to Vacuum Drying," ANS Winter Meeting, Orlando, FL.
5. Zampella, C., M. Hadj-Nacer, and M. Greiner, (2018) "Experimental Measurement of Temperature Jump Coefficient in the Slip Regime," ANS Winter Meeting, Orlando, FL.
6. Higley, M., M. Hadj-Nacer, and M. Greiner, (2018) "Temperature Prediction of a TN-32 Used Nuclear Fuel Canister Subjected to Vacuum Drying Conditions," Proc. of the ASME Pressure, Vessel, and Pipe (PVP) conference, Prague, Czech Republic.
7. Zampella, C., M. Hadj-Nacer, and M. Greiner, (2018) "Temperature Jump Measurement at Stainless Steel and Helium Interface: Application to Used Nuclear Fuel Vacuum Drying Process," Proc. of the ASME Pressure, Vessel, and Pipe (PVP) conference, Prague, Czech Republic.
8. Maharjan, D., M. Hadj-Nacer, M. Greiner and S.K. Stefanov, (2018) "Comparison of DSMC and CFD Models of Heat Transfer in a Rarefied Two-Dimensional Geometry," Proc. of the ASME Pressure, Vessel, and Pipe (PVP) conference, Prague, Czech Republic.
9. Maharjan, D., M. Hadj-Nacer, and M. Greiner, (2017) "Experimentally-Benchmarked CFD Model to Predict Cladding Temperatures During Vacuum Drying," ANS Winter Meeting, Washington, DC.
10. Maharjan, D., M. Hadj-Nacer, and M. Greiner, (2017) "Experimentally Benchmarked Computational Fluid Dynamics Simulations of a 7×7 Array of Heated Rods within a Square-Cross-Section Enclosure Filled With Rarefied Helium," Proc. of the ASME Pressure, Vessel, and Pipe (PVP) conference, Waikoloa Village, HI.
11. Maharjan, D., M. Hadj-Nacer, and M. Greiner, (2017) "Temperature Measurement of an Array of Heated Rods Subjected to Vacuum Drying Conditions," Proc. of the ASME Pressure, Vessel, and Pipe (PVP) conference, Waikoloa Village, HI.
12. Trujillo, C., M. Hadj-Nacer, and M. Greiner, (2017) "Effect of Rarefication on Cladding Temperatures within a Used Nuclear Fuel Canister Filled with Dry Helium," International High-Level Radioactive Waste Management (IHLRWM), Charlotte, NC.
13. D. Maharjan, M. Hadj-Nacer, N. Chalasani, and M. Greiner, (2016) "Experimentally-Benchmarked Computational Fluid Dynamics Simulations of an Array of Heated Rods within a Square-Cross-

Section Helium-Filled Pressure Vessel," Proc. of the ASME Pressure, Vessel, and Pipe (PVP) conference, Vancouver, BC, Canada.

14. Maharjan, D., Hadj-Nacer, M., M. Greiner, S. K. Stefanov and I. Graur, (2017) "Gas Rarefaction Effect on Cladding Temperature during Vacuum Drying of Used Nuclear Fuel Canister," ANS Winter Meeting, Las Vegas, NV.

15. Hadj-Nacer, M., M. Triton and M. Greiner, (2015) "Geometrically-Accurate-Three-Dimensional Simulations of a Used Nuclear Fuel Transfer Canister Filled with Pressurized Helium." Proc. of the ASME Pressure Vessels & Piping Conference, Boston, MA.

16. Green, R., M. Hadj-Nacer, and M. Greiner, (2015) "Design of an Experiment to Measure the Thermal Accommodation Coefficient Between Helium and Stainless-Steel in Concentric Cylinders" Proc. of the ASME Pressure Vessels & Piping Conference, Boston, MA.

17. Hadj-Nacer, M., D. Maharjan, M. T. Ho, I. Graur, S. K. Stefanov and M. Greiner, (2015) "Simulation of Heat Transfer across Rarefied Gas in Annular and Planar Geometries: Comparison of Navier-Stokes, S-Model and DSMC Methods Results." Proc. of the ASME International Conference on Nanochannels, Microchannels, and Minichannels, San Francisco, CA.

18. Manzo, E.T., M. Hadj-Nacer., M.T. Ho, I. Graur and M. Greiner, (2015) "Phenomena Affecting Used Nuclear Fuel Cladding Temperatures During Vacuum Drying Operations," International High-Level Radioactive Waste Management (IHLRWM), Charleston, SC.

19. Green, R., E.T. Manzo, M. Hadj-Nacer, M. Greiner, J. Li and Y.Y. Liu (2014) "Design of an Experimental Apparatus to Measure the Thermal Accommodation Coefficient between Stainless Steel Surfaces and Rarefied Helium." Proc. of the ASME Pressure Vessels & Piping Conference, Anaheim, CA.

20. Manzo, E. T.., R. Green, M. Hadj-Nacer, and M. Greiner, (2014) "Prediction of Cladding Temperatures within a Used Nuclear Fuel Transfer Cask Filled With Rarefied Helium," Proc. of the ASME Pressure Vessels & Piping Conference, Anaheim, CA.

21. Hadj-Nacer, M., P. Perrier, J. G. Méolans, I. Graur and M. Wüest, (2012). "Experimental Study of Gas Flows Through Channels with Circular Cross Sections," International GasMEMS Conference, Skiathos, Greece.

22. Hadj-Nacer, M., I. Graur, and P. Perrier (2011) "Accommodation coefficients measurement in rectangular microchannels." 3nd International GASMEMS Workshop, Bertinoro, Italy.

23. Hadj-Nacer, M., I. Graur, P. Perrier, (2011) "Mass Flow Rate Measurement through Rectangular Microchannels for Large Knudsen Number Range," Proc. of the ASME 2011 International Conference on Nanochannels, Microchannels, and Minichannels, ICNMM, Edmonton, Canada.

24. Hadj-Nacer, M., I. Graur, P. Perrier, (2011) "Accommodation Coefficient Investigation in all Flow Regimes: From Hydrodynamic to Near Free Molecular Regimes," Proc. of the 4th International Conference on Heat Transfer and Fluid Flow in Microscale, HTFFM-IV, Fukuoka, Japan.

25. Hadj-Nacer, M., I. Graur, P. Perrier, (2010) "Mass Flow Rate Measurement through Rectangular Micro-channels In a Large Knudsen Number Range," 2nd GasMEMS Workshop, Les Embiez, France.

26. Hadj-Nacer, M., I. Graur, and P. Perrier (2010) "Mass Flow Measurement in Rectangular Micro-Channel From Hydrodynamic to Near Molecular Regime." 2nd European Conference on Microfluidics, Toulouse, France.

Presentations (Not in Proceedings)

1. Hadj-Nacer, M., N. Pandey, M. I. Hasan, K. Rahe and M. Greiner (2019), "Phase Change and Two-Phase Flow in Porous Media: Experiments and Simulations," 4th Thermal and Fluids Engineering Conference (TFEC), Las Vegas, NV.

2. Hadj-Nacer, M., M. I. Hasan, K. Rahe and M. Greiner (2019), "Modeling of Heat Transfer and Flow Patterns in a Porous Wick," NV NASA EPSCoR Statewide Meeting, Reno, NV.

3. Hadj-Nacer, M., "Drying Methods for Used Nuclear Fuel Canisters" (2019), Holtec International, Camden, PA.

4. Hadj-Nacer, M., N. Pandey, M. I. Hasan, K. Rahe and M. Greiner (2018), "Phase-change and two-phase flow in Porous media, Progress Report," NASA Jet Propulsion Laboratory (JPL), Pasadena, CA.
5. Hadj-Nacer, M., M. Higley, D. Maharjan, C. Zampella, and M. Greiner (2018), "Temperature Prediction of a Used Nuclear Fuel Canister under Rarefied Gas Condition," 31st Symposium on Rarefied Gas Dynamics (RGD), Glasgow, UK.
6. Hadj-Nacer, M., Md. Shujan, N. Pandey, and M. Greiner (2018), "Modeling of Heat Transfer and Flow Patterns in a Porous Wick: Parametric Study," 3rd Thermal and Fluids Engineering Conference (TFEC), Fort Lauderdale, FL.
7. Hadj-Nacer, M., N. Pandey, and M. Greiner (2017), "Phase-change and two-phase flow in Porous media (Application in Loop Heat Pipe), Progress Report," NASA Jet Propulsion Laboratory (JPL), Pasadena, CA
8. Hadj-Nacer, M., N. Pandey, and M. Greiner (2017), "Modeling of Heat Transfer and Flow Patterns in a Porous Wick," NV NASA EPSCoR Statewide Meeting, Las Vegas, NV.
9. Hadj-Nacer, M., Md. Shujan, N. Pandey, and M. Greiner (2016), "Pumped Two-Phase Cooling Loop, Progress Report," NASA Jet Propulsion Laboratory (JPL), Pasadena, CA.
10. Hadj-Nacer, M., (2012), "Etude de l'interaction gaz/surfaces dans des micro-canaux dans tous les régimes d'écoulement," IUSTI, Marseille, France (in French).
11. Hadj-Nacer, M., I. Graur, P. Perrier, (2011) "Mass flow rate measurements through microchannels with Gold and Silica surfaces in all flow regimes," 64th IUVSTA Workshop, Leinsweiler, Germany.
12. Hadj-Nacer, M., I. Graur, P. Perrier, (2011) "Momentum accommodation coefficient in rectangular microchannels for all flow regimes," 15th International Meeting on Thermal Sciences, Tlemcen, Algeria.
13. Hadj-Nacer, M., M. Wüest, I. Graur, P. Perrier, (2011) "Momentum accommodation coefficients in microtubes," INFICON, Balzers, Liechteinstein.

TEACHING EXPERIENCE

University of Nevada Reno, NV
- ME 322, "Instrumentation," Lectures and labs, 4 Credits
  - Fall 2016, Enrollment: 23 students
  - Spring and Fall 2017, Enrollment: Total 163 students
  - Spring and Fall 2018, Enrollment: Total 190 students
  - Fall 2019, Enrollment: 33 students
- ME 791, "Special Topic," 3 Credits.
  - Fall 2017, Fall 2018, Spring 2018
- ME 499, "Special Project," 3 Credits
  - Fall 2017, Spring 2018

TEACHING INTERESTS

- Two-phase Heat Transfer and Flow
- Enhanced Heat Transfer
- Kinetic Theory of Gases
- Fundamentals and Applications of Microfluidics
- Computational Fluid Dynamics
- Instrumentation (Sensors and Actuators)

GRADUATE STUDENT ADVISED AND CO-ADVISING

1. Megan Higley, Ph.D. (Expected Dec. 2022), "Development of a Geometrically-Accurate Three-Dimensional Model of the TN-32 Used Nuclear Fuel Canister." University of Nevada Reno.
2. Joel Kaderka, M.S. (Expected Dec. 2020), "Thermal Response Prediction for Nuclear Material Staging at the Nevada National Security Site," University of Nevada Reno.
3. Kegan Rahe, M.S. (Expected Dec. 2020), "Development of an Experimental Apparatus to Study Flow and Phase Change in Porous Media", University of Nevada Reno.
4. Mitchell Lane, M.S. (Expected May 2020), "Measurement of the Thermal Accommodation Coefficient for Water Vapor and Helium Mixtures," University of Nevada Reno.
5. M. Iffat Hasan, M.Sc. (Expected Dec. 2019), "Modeling of flow and Phase Change in Porous Media Using an Open Source Code", University of Nevada Reno.
6. Cody Zampella, M.Sc. (May 2019), "Development and Experimental Benchmark of Computational Models to Predict Cladding Temperature and Vapor Removal from UNF Canisters during Drying Operations" University of Nevada Reno.
7. Nishan Pandey, M.Sc. (Aug. 2018), "Mechanically Pumped Loop Heat Pipe Development for Orbit and Deep Space Mission." University of Nevada Reno. (Co-Advised)
8. Dilesh Maharjan, Ph.D. (May 2018), "Experimentally Benchmarked Computational Fluid Dynamics Simulations of a 7×7 Array of Heated Rods within a Square-Cross-Section Enclosure Filled with Rarefied Helium." University of Nevada Reno. (Co-Advised)
9. Md. Shujan Ali, M.Sc. (Jan. 2017), "Modeling of Heat Transfer and Flow Patterns in a Porous Wick: Parametric Study." University of Nevada Reno. (Co-Advised)
10. Corey Trujillo, M.Sc. (Jan. 2017), "Geometrically-Accurate Three-Dimensional Simulations of Heat Transfer in Used Nuclear Fuel Canister during Vacuum Drying." University of Nevada Reno
11. Md. Hasibul Alam, M.Sc. (Jan. 2016), "ANSYS\Fluent Simulation Model Development for Forced Helium Dehydration Process." University of Nevada Reno. (Co-Advised)
12. Ernesto, T. Manzo, M.Sc., "Geometrically-Accurate Two-Dimensional Simulations of Heat Transfer in Used Nuclear Fuel Canister during Vacuum Drying." University of Nevada Reno. (Co-Advised)
13. Rachel Green, M.Sc. (May. 2015), "Measurement of thermal accommodation and temperature jump coefficients for stainless steel surfaces and rarefied helium for coaxial cylinders." University of Nevada Reno. (Co-Advised)

UNDERGRADUATE STUDENT SUPERVISED

1. Joel Kaderka, B.S. (Fall 2018 – Spring 2019), "Enhanced heat transfer in Grooved and Intermittently-Grooved Channels," University of Nevada Reno.
2. Mitchell Lane, B.S. (Spring 2018 – Spring 2019), ""Development of an Injection System of Vapor into Vacuum to Measure the Thermal Accommodation Coefficient of Water Vapor," University of Nevada Reno.
3. Kegan Rahe, B.S. (Fall 2017 – Spring 2019), "Design of an Experimental Apparatus to Study Flow and Phase Change in Porous Media", University of Nevada Reno.
4. Megan Higley, B.S. (Fall 2017 – Fall 2018), "Construction of a Geometrically-Accurate Two-Dimensional Model of the TN-32 Nuclear Fuel Cask." University of Nevada Reno.
5. Manuel Retana, B.S. (Summer 2016), "Evaporation Model Development for Forced Helium Dehydration Process Applied to Used Nuclear Fuel Canister." University of Nevada Reno.
6. Walid Ghani, B. S. (Fall 2016), "Construction of a 7×7 Array experimental apparatus of Heated Rods within an Enclosure Filled with Rarefied Helium." University of Nevada Reno.
7. Joseph Young, B.S. (Spring 2016), "Construction of Used Nuclear Fuel Assembly Model in ANSYS APDL." University of Nevada Reno.

8. Blake McCoy, B.S. (Spring and Summer 2014), "Construction of the heat flux gauges for flat and grooved passage channel experiment." University of Nevada Reno.
9. Joshua McGuire, B.S. (Spring and Summer 2014), "Construction of a guard heaters to eliminate heat loss from flat and grooved passage channel experiment." University of Nevada Reno.

PROFESSIONAL SERVICE

- Reviewer for the Physics of Fluids, Nuclear Technology, Fluids Engineering, Vacuum, and Nuclear and Engineering Design journals.
- Session chair at the 2016 ASME PVP conference and Co-chair at the 2018 ASME PVP conference.
- Co-TPR (Technical Paper Representative) for the 2020 ASME PVP conference.
- Member of the Thermophysics Committee of AIAA

DEPARTMENT SERVICE

- Member of the differential fees committee (2017 - 2018), University of Nevada, Reno.
- Member of the search committee for Development Technician (Fall 2017), University of Nevada Reno.
- Member of the Lab committee (2018), University of Nevada Reno.
- Member of the search committee for Full/Associate Professor in CFD (Fall 2018), University of Nevada Reno.

PROFESSIONAL AFFILIATION

- American Institute of Aeronautics and Astronautics (AIAA), member
- American Society of Mechanical Engineers (ASME), member
- American Nuclear Society (ANS), member
- American Society of Thermal and Fluids Engineers (ASTFE), member
- Algerian American Scientists Association (AASA), member

RESEARCH INTEREST/EXPERIENCE

Porous Media Two-Phase Flow and Phase-Change, University of Nevada Reno   2015- Present
- Project: Advanced Transport Technologies for NASA Thermal Management/Control Systems.
- Develop an OpenFOAM solver for flow and phase change in porous media.
- Develop a 1-D in-house code to model evaporation and condensation in porous media.
- Design an experimental apparatus for two-phase flow and phase-change in porous media.
- Supervise research of four Master's Degree students and one undergraduate students.

Drying Operations Applied to Nuclear Fuel Assemblies, University of Nevada Reno   2013-Present
- Projects:
  - Development and Experimental Benchmark of Simulations to Predict Used Nuclear Fuel Cladding Temperatures during Drying and Transfer Operations.
  - Development and Experimental Benchmark of Computational Models to Predict Cladding Temperature and Vapor Removal from UNF Canisters during Drying Operations.
- Implement low-pressure thermal-resistance temperature-jump boundary conditions to CFD simulations of heat transfer in geometries relevant to drying of used nuclear fuel canisters.
- Design and construction of an experimental apparatus representing a section of a nuclear fuel assembly. This experiment is used to benchmark ANSYS/FLUENT simulations.

- Perform CFD simulations in a geometrically-accurate three-dimensional model of a nuclear fuel canister (TN-24) created using ANSYS/FLUENT to evaluate its peak cladding temperature under vacuum drying and storage conditions.
- Apply evaporation and condensation models to CFD simulations of heat and mass transfer during Forced Helium Dehydration of a nuclear fuel assembly.
- Collaborate with Dr. Irina Graur and Dr. Stefan Stefanov to apply the kinetic theory of gases to heat transfer in concentric cylinders and parallel plates.
- Create a half model of the TN-32 nuclear fuel cask in ANSYS/FLUENT.
- Supervise research of one Ph.D., four Master's degree, and three undergraduate students.

Enhanced Heat Transfer in Grooved Channels, University of Nevada Reno   2013 - 2014
- Project: Enhanced Single-Phase Heat Transfer in Intermittently-Grooved Channels.
- Re-design and improve an existing apparatus to quantify the performance of flat and grooved passage channels used in cooling systems.
- Design, construct, and install heat flux gauges and guard heaters to eliminate heat loss from the experimental apparatus.
- Supervise research of two undergraduate students.

Rarefied Gases Dynamics in Microchannels, Aix-Marseille University, Marseille, France   2009 - 2012
- Project: Gas micro-flows in slip regime: isothermal and non-isothermal flows.
- Develop an experimental apparatus to measure the mass flow rate of rarefied gas through microchannels of circular and rectangular cross-sections under isothermal and stationary conditions. All regimes of rarefaction were considered.
- Measure the tangential momentum accommodation coefficient (TMAC) for different surface materials (gold, silica, stainless steel, and sulfinert) and gases (helium, nitrogen, argon, and carbon dioxide).
- Use of the Linearized BGK kinetic model to solve the Boltzmann equation to calculate the mass flow rate through microchannels in the transitional and free molecular flow regimes. The results were compared to the experiment.

Thermal Creep Effect in Microchannels, Aix-Marseille University, Marseille, France   2009
- Develop an experimental apparatus to measure the mass flow rate caused by the thermal transpiration effect in a circular microchannel at different temperatures.
- Conduct kinetic mass flow rate calculations using the kinetic ellipsoidal model to solve the Boltzmann equation.

SKILLS AND COMPETENCIES

- Languages: English, French, Arabic, and Amazigh.
- Computer: ANSYS/Fluent*, OpenFOAM, SolidWorks*, FDS*, LabVIEW*, FORTRAN*, PYTHON, C, C++ and Microsoft Office*. (* very experienced)