Edna Toro

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EDUCATION

Stanford University   **Stanford, CA**
MS + PhD in Mechanical Engineering   *Anticipated Dec 2025*

University of Rochester   **Rochester, NY**
Bachelor of Science in Mechanical Engineering   *May 2019*
Minor in German

Chattanooga State Community College   **Chattanooga, TN**
Associate of Science in Mechanical Engineering, summa cum laude   *May 2016*

HONORS AND AWARDS

University of Rochester:	**Chattanooga State:**
Dean's List, 3 out of 4 semesters	Dean's List, 4 out of 4 semesters
Tau Beta Pi	Presidential Excellence Award
Xerox Fellowship 2017	Global Scholars Graduate
Kearns Scholar	Phi Beta Kappa International Honor Society
	All-USA Community College Academic Team 2016

MECHANICAL ENGINEERING RESEARCH EXPERIENCE & INDEPENDENT STUDIES

STANFORD UNIVERSITY – DEPARTMENT OF MECHANICAL ENGINEERING   **Stanford, CA**
Doctoral Student Researcher, Stanford University   Fall 2019 – present
- Conducted experimental campaigns, obtaining the first conductivity measurements of non-equilibrium warm dense copper using femtosecond lasers and Terahertz (THz) spectroscopy.
- Analyzed the obtained data and uncovered the role of the crystalline structure in the electron transport between the condensed matter and plasma transition
- Led an experimental campaign to measure the structure of nickel and carbon at extreme states using ultrafast electron diffraction to understand how ultra-short pulses affect solid matter
- Designed experimental equipment using SolidWorks to study extreme environments, e.g., water jets operating at 10E-6 bar and a pressure cell that holds water at 673.15 K and 25 MPa
- Enhanced THz spectroscopy apparatus by testing new optical crystal configurations, boosting signal-to-noise ratio up to 300%

LAWRENCE LIVERMORE NATIONAL LABORATORY   **Stanford, CA**
Graduate Student Intern, National Ignition Facility and Photon Science   Summer 2024 & 2025
- Analyzed Optical Thomson Scattering (OTS) data to characterize plasma in inertial fusion-like conditions
- Designed a time-dependent nanosecond-scale optical filter to extend the temporal range of OTS diagnostics at the National Ignition Facility (NIF) for inertial confinement fusion experiments
- Modeled X-ray emission using VISRAD (a 3-D thermal radiation CAD tool) to support the proposed system changes at NIF
- Presented system changes to the OTS and machine safety teams at NIF, and incorporated safety

UNIVERSITY OF ROCHESTER – DEPARTMENT OF MECHANICAL ENGINEERING   **Rochester, NY**
Independent Research in Mixing Lab   *May 2018 – present*
- Analyzed fluid flow using particle tracking velocimetry through MATLAB
- Designed algorithms to measure artery width and phase averaging on the fluid inside of mice brains
- Measured self-assembly time of peptide aggregation under different conditions

Independent Research under Dr. Renato Perucchio   *December 2016 – February 2018*
- Perform linear, non-linear, and dynamic analysis in computational solid and structural mechanics
- Implement Finite Element Methods in monumental concrete domes to study engineering practices in classical antiquity
- Develop new 3D models in NX and Abaqus CAE for Mesoamerican structures

- Implemented tetrahedral meshing for several structures

Independent Studies under Dr. Christopher Muir   *August 2017 – present*
- Design the Chassis for an off-road vehicle following the rules of Baja SAE competitions.
- Develop Finite Element Evaluations in Siemens NX (Nastran) to test the nodal stresses and deformations applied to the frame and body panels of the off-road vehicle.
- Perform Finite Element and Kinematic analysis to obtain the forces exerted on the frame by the suspension and engine.

PRESENTATIONS

1. **Edna R Toro**, Megan Ikeya, Mianzhen Mo, Siegfried Glenzer, Benjamin Ofori-Okai, 2024, Warm Dense Copper conductivity measurements using single-shot THz spectroscopy, APS DPP, Atlanta, GA
2. **Edna R Toro**, Colin Bruulsema, Eric Folsom, Edward Marley, George Swadling. 2024, Optical Thomson Scattering Analysis from NLTE mid-Z plasmas. OTS Workshop, Livermore, CA
3. **Edna R Toro**, Megan Ikeya, Mianzhen Mo, Siegfried Glenzer, Benjamin Ofori-Okai, 2023, Aluminum conductivity measurements using single-shot THz spectroscopy, APS DPP, Denver, CO
4. **Edna R Toro**, Megan Ikeya, Mianzhen Mo, Siegfried Glenzer, Benjamin Ofori-Okai, 2023, Warm Dense Copper conductivity measurements using single-shot THz spectroscopy, FiMEC Seminar, Osaka, Japan
5. **Edna R Toro**, Megan Ikeya, Mianzhen Mo, Siegfried Glenzer, Benjamin Ofori-Okai, 2023, Details of a single-shot terahertz apparatus optimized for high energy density science experiments, APS Far West, Honolulu, HI
6. **Edna R Toro**, Jeffrey Tithof, Humberto Mestre, Maiken Nedergaard, Douglas H. Kelley, 2018, Shear Measurements of Cerebrospinal Fluid Flow, APS DFD, Atlanta, GA
7. **Edna R Toro**, Jeffrey Tithof, Humberto Mestre, Maiken Nedergaard, Douglas H. Kelley, 2018, Shear Measurements of Cerebrospinal Fluid Flow, SHPE National Convention, Cleveland, OH
8. **Edna R Toro**, Jeffrey Tithof, Douglas H. Kelley, 2018, Shear Effects on Amyloid Beta 42 Aggregation, Summer Research Symposium, Rochester, NY
9. **Edna R Toro**, R. Perucchio, 2017. Structural analysis of the Temple of the Seven Dolls in Dzibilchaltum, Mexico, National Conference of Undergraduate Research, Edmond, OK
10. **Edna R Toro**, R. Perucchio, 2017. Structural analysis of the Temple of the Seven Dolls in Dzibilchaltum, Mexico, Summer Research Symposium, Rochester, NY

PUBLICATIONS
1. **Edna R Toro**, Tobias Held, Megan Ikeya, Max Maigler, Eric R Sung, Mianzhen Mo, Armin Bergermann, Baerbel Rethfeld, Siegfried H Glenzer, and Benjamin K Ofori-Okai. Observing the influence of atomic and nanoscale structure on the DC conductivity of warm dense matter. [In preparation]
2. Benjamin K Ofori-Okai, Adrien Descamps, **Edna R Toro**, Megan Ikeya , Stephanie B Hansen, Mianzhen Mo, Andrew D Baczewski, Danielle Brown, Luke B Fletcher, Emma E McBride, Xiaozhe Shen, Anthea Weinmann, Jie Yang, Jochen Schein, Zhijiang Chen, Xijie Wang, Siegfried H Glenzer. Unveiling Structural Effects on the DC Conductivity of Warm Dense Matter via 5 Terahertz Spectroscopy and Ultrafast Electron Diffraction. [In preparation]
3. Emeric Boigne, Mohammed M Ahmed, Collin Foster, **Edna R Toro**, Dula Y Parkinson , Alastair A MacDowell , F Panerai, Chiara Saggese, Matthias Ihme. Rapid in situ X-ray imaging at extreme temperatures unlocks new insights into wildfire ember showers. [Submitted]
4. Willow Martin, Joseph Nilsen, Luke Fletcher, Michael MacDonald, Lex Andersen, Ariel Arnott, Hannah Bellenbaum, Maximilian Böhme, Nina Boiadjieva, Nicholas Czapla, Thomas Cowan, Tilo Doeppner, Gilliss Dyer, Robert Ettelbrick, Roger W Falcone, Stefano Faubel, Eric Galtier, Alejandro Laso Garcia, Thomas Gawne, Levi Hancock, Philip Hart, Nicholas Hartley, Marie-Luise Herbert, X Huang, Girik Jain, Kavita Desai Kabelitz, Dimitri Khaghani, Dominik Kraus, Hae Ja Lee, Piezi Li, Yongfeng Lu, Magi Mettry-Yassa, Peregrine McGehee, Bob Nagler, Johannes Rips, Samuel Schumacher, **Edna R Toro**, Toma Toncian, Xiaoxing Xia, Arianna Gleason, and Siegfried Glenzer. Characterizing laser-heated polymer foams with simultaneous X-ray fluorescence spectroscopy and Thomson scattering at the Matter in Extreme Conditions Endstation at LCLS. [Submitted]
5. Priyanka Muhunthan, Haoyuan Li, Guillaume Vignat, **Edna R Toro,** Khaled Younes, Yanwen Sun, Dimosthenis Sokaras, Thomas Weiss, Ivan Rajkovic, Taito Osaka, Ichiro Inoue, Sanghoon Song, Takahiro Sato, Diling Zhu,

John L Fulton, Matthias Ihme. 2024. A versatile pressure-cell design for studying ultrafast molecular dynamics in supercritical fluids using coherent multi-pulse x-ray scattering. Review of Scientific Instruments

6. Thorsten Zirwes, Guillaume Vignat, **Edna R Toro**, Emeric Boigné, Khaled Younes, Dimosthenis Trimis, Matthias Ihme. 2023. Improving volume-averaged simulations of matrix-stabilized combustion through direct X-ray μCT characterization: Application to NH3/H2-air combustion. Combustion and Flame

7. Guillaume Vignat, Thorsten Zirwes, **Edna R Toro**, Khaled Younes, Emeric Boigné, Priyanka Muhunthan, Lauren Simitz, Dimosthenis Trimis, Matthias Ihme. 2023. Experimental and numerical investigation of flame stabilization and pollutant formation in matrix stabilized ammonia-hydrogen combustion. Combustion and Flame.

8. Guillaume Vignat, Bassem Akoush, **Edna R Toro**, Emeric Boigné, Matthias Ihme. 2023. Combustion of lean ammonia-hydrogen fuel blends in a porous media burner. Proceedings of the Combustion Institute.

9. Ting Du, Humberto Mestre, Benjamin T Kress, Guojun Liu, Amanda M Sweeney, Andrew J Samson, Martin Kaag Rasmussen, Kristian Nygaard Mortensen, Peter AR Bork, Weiguo Peng, Genaro E Olveda, Logan Bashford, **Edna R Toro**, Jeffrey Tithof, Douglas H Kelley, John H Thomas, Poul G Hjorth, Erik A Martens, Rupal I Mehta, Hajime Hirase, Yuki Mori, Maiken Nedergaard. 2022. Cerebrospinal fluid is a significant fluid source for anoxic cerebral oedema. Brain.

10. Humberto Mestre, Ting Du, Amanda M Sweeney, Guojun Liu, Andrew J Samson, Weiguo Peng, Kristian Nygaard Mortensen, Frederik Filip Stæger, Peter AR Bork, Logan Bashford, **Edna R Toro**, Jeffrey Tithof, Douglas H Kelley, John H Thomas, Poul G Hjorth, Erik A Martens, Rupal I Mehta, Orestes Solis, Pablo Blinder, David Kleinfeld, Hajime Hirase, Yuki Mori, Maiken Nedergaard. 2020. Cerebrospinal fluid influx drives acute ischemic tissue swelling. Science.

SELECTED MECHANICAL ENGINEERING PROJECTS

IMPACT OF FOOT SHAPE ON AQUATIC BIRD LOCOMOTION   **Rochester, NY**
Independent Studies under Dr. Jessica Shang   *January 2017 –May 2017*

- Designed and built an application to measure the impact of foot shape on aquatic bird locomotion.
- Designed and mounted a rig system to attach the modeled extremities to a tow tank.
- Realized communication trough the strain gauges to the devices to collect strain data.
- Created a program via Matlab that would read the data collected from LabVIEW (approximately 50000 data points per trial) and transform the results into stress plots and tables.
- Presented efforts and final outcomes via poster as well as question and answer sessions with faculty and peers.

INVESTIGATION OF FORCES ON OFF-ROAD VEHICLE TIE RODS   **Rochester, NY**
Independent Studies under Professor Scott Russel   *August 2017 – present*

- Design a system to measure the strains on a vehicle member during static and operating vehicle testing.
- Perform calibration of the system by comparing the strain obtained with a tensile test machine, vs the strain obtained by a gravity load in the vehicle.
- Realize communication between strain gauges and microcontroller, to obtain stress data in dynamic testing.
- Present efforts and final outcomes via poster as well as question and answer sessions with faculty and peers.

TEACHING EXPERIENCE

STANFORD UNIVERSITY
Teacher Assistant   **Rochester, NY**
– **ME 225: Introduction to Fluid Mechanics**   *Spring 2021- Fall 2021*

UNIVERSITY OF ROCHESTER
Teacher Assistant   **Rochester, NY**
– **ME 225: Introduction to Fluid Mechanics**   *Fall 2017 - 2018*
– **ME 226: Introduction to Solid Mechanics**   *Spring 2018*
– **ME 251: Heat and Power Applications**   *Spring 2019*

Tutor at Kearns Center   *August 2016 – December 2016*
- Provided one-on-one tutoring assistance to high school students in preparation for the national examinations.

CAMPUS LEADERSHIP

STANFORD UNIVERSITY	**Stanford, CA**
Taekwondo club, safety officer,	Summer 2019– present
UNIVERSITY OF ROCHESTER	**Rochester, NY**
BAJA SAE Frame Project Team Leader	*August 2016 – present*
CHATTANOOGA COMMUNITY COLLEGE	**Chattanooga, TN**
Phi Theta Kappa, Vice-President of Scholarship	*August 2014 – May 2016*
Student Government Association, Senator	*August 2015 – May 2016*
Diversity Club, Treasurer	*August 2014 – May 2016*

TECHNICAL AND QUANTITATIVE SKILLS

Programming Languages: Python, MATLAB, Java
CAD and Finite Element Analysis: Siemens NX, SolidWorks, Creo Parametric, Abaqus CAE, Nastran
Experimental skills: setup design, manual machining, general electronics, optical alignment, and beam diagnostics, laboratory technician skills
Fluent: English and Spanish| **Elementary proficiency**: German