

### **Short Biography – Prof. Chloé Arson, Cornell University**

Dr. Chloé Arson is a Professor in the School of Civil and Environmental Engineering (CEE) at Cornell University. Prior to Cornell, she was a faculty member at the Georgia Institute of Technology (2012-2023) and at Texas A&M University (2009-2012). She earned her Ph.D. at Ecole Nationale des Ponts et Chaussées (France) in 2009. Dr. Arson's expertise is in computational geomechanics, with a particular focus on damage and healing mechanics of polycrystalline materials, multi-scale modeling of porous media, and bio-inspired geotechnical design. Her group developed modeling approaches that have allowed a fundamental understanding of synergetic micro-mechanisms in rocks, the prediction of instabilities in geomaterials, and the simulation of concurrent fracture propagation at multiple scales. Her lab creates numerical models to assess the performance and environmental impacts of underground storage and rock fracturing, explain the formation of soil from rock weathering, predict grain fragmentation under high-pressure, and optimize underground excavation, propulsion, and exploration. Homogenization, computational mechanics, Artificial Intelligence (AI) and network dynamics are the pillars of Arson's work. Inter-disciplinary collaborations have enabled her group to deploy modeling strategies for civil engineering, Earth sciences, material sciences, robotics, and biology. Dr. Arson was awarded over \$8.3 million in research funding from the U.S. National Science Foundation (NSF), the U.S. Department of Energy, National Laboratories, the Georgia Department of Transportation, industry, and international scholarships. She published over 80 journal articles and over 60 peer-reviewed conference papers. In 2019, she delivered the Early Career Address of the American Rock Mechanics Association (ARMA). She received the NSF CAREER and NSF BRITE awards, in 2016 and 2021 respectively.

Dr. Arson's teaching portfolio focuses on engineering mechanics, including the freshman introduction to civil engineering, mechanics of materials for junior students, and more advanced classes at the graduate level, such as theoretical geomechanics, the linear Finite Element Method (FEM) in solid mechanics, and FEM modeling in poroelasticity. She has advised/co-advised 2 postdoctoral researchers, 14 Ph.D. students, 12 M.Sc. students, 85 undergraduate students, and 13 visiting scholars on research projects. Dr. Arson graduated ten Ph.D. students, who are now researchers, faculty members or developers in top institutions or companies. At Georgia Tech, Dr. Arson created the "CEE Gateways to France" program to sustain collaborations between Georgia Tech (GT) professors and faculty from top engineering schools of the Paris area, through GT student internships in France. The program has been funded by two NSF IRES grants and has supported/is supporting over 30 internships. Research done at the IRES site contributed to six journal papers co-authored by student participants. Dr. Arson was an associate editor for *Rock Mechanics and Rock Engineering* between 2018 and 2023, and she is currently an associate editor for the *Journal of Engineering Mechanics*, *Open Geomechanics* and *Scientific Reports*<sup>1</sup>.

Five recent representative journal articles:

- D. Chou, M. Etcheverry, C. Arson, 2024. Three-dimensional biphasic fabric estimation from 2D images by deep learning, *Scientific Reports*, DOI: 10.1038/s41598-024-59554-x.
- T. Xu, C. Arson, 2023. Interface homogenization approach for mechanical healing driven by pressure solution, *Journal of Engineering Mechanics*, DOI: 10.1061/JENMDT/EMENG-7079.
- T. Xu, X. Shen, M. Reed, N. West, K. Ferrier, C. Arson, 2022. Anisotropy and microcrack propagation induced by weathering, regional stresses and topographic stresses, *Journal of Geophysical Research - Solid Earth*, DOI:10.1029/2022JB024518
- X. Shen, J. Ding, C. Arson, F. Chester, J. Chester, 2021. Micro-mechanical Modeling for Rate-Dependent Behavior of Salt Rock under Cyclic Loading, *International Journal for Numerical and Analytical Methods in Geomechanics*, DOI: 10.1002/nag.3133.
- F. Patino-Ramirez, C. Arson, 2019. Transportation networks inspired by leaf venation algorithms, *Journal of Bioinspiration and Biomimetics*, DOI: 10.1088/1748-3190/ab7571.

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<sup>1</sup> Dr. Arson is an editorial board member of *Scientific Reports*. Board members play the role of associate editors for that journal.

## **EMI Vision statement – Prof. Chloé Arson, Cornell University**

It is my honor to present my application to join the Board of Governors (BoG) of the Engineering Mechanics Institute (EMI). My vision is to cultivate international scholarship in a working environment that celebrates diversity. I am committed to fostering multi-disciplinary research through rigorous scientific reviews, programmatic committees, mentoring activities, and inclusive scientific venues.

I have been a member of the EMI committees on poromechanics (since 2015), education (since 2022), and Machine Learning (ML) in Mechanics (since 2023). I have served as an Associate Editor of the *Journal of Engineering Mechanics* since 2019. I was elected Vice Chair (2018-2019) and then Chair (2019-2021) of the EMI poromechanics committee. In 2019, the committee counted 60 members, including 2 women. I actively recruited scientists who identify as women, who made 19% of the members (10/53) after my tenure. I initiated a mentoring program that allows junior committee members to receive career and scholarly guidance from more senior members. This program is still in place today. An open-access repository for poromechanics instruction was also created when I was chair. That repository contains course notes and problem sets<sup>1</sup>. In 2023, I co-chaired the EMI 2023 conference at Georgia Tech. We hosted over 830 participants on campus. The conference program included 65 parallel sessions and 6 keynote lectures, as well as new activities, such as a LGBTQ+ safe space training, a workshop for the professional development of newly tenured faculty members, and a student/industry mixer. The day before the EMI 2023 conference, I co-organized an NSF-funded workshop<sup>2</sup> on engineering mechanics education, which aimed to discuss the very definition of applied mechanics in the broader engineering curriculum and highlight potential pathways to reshape the boundaries of engineering mechanics in view of climate change and emerging data science technologies. The workshop attracted over 60 students, postdocs, and faculty members from R1 and R2 universities in the United States and abroad. The workshop activities pointed towards a need to better integrate sustainability and social justice in the teaching of engineering design, and to use new technologies to offer a customized education to each student. My plan is to contribute to addressing these needs in my current role of Vice-Chair (and future Chair) of the EMI education committee.

If I am elected to the BoG, my objectives are to: (i) find synergies between my work in education, poromechanics and ML for the EMI and my involvement in other professional associations, e.g., the American Rock Mechanics Association (ARMA) and the American Geophysical Union (AGU); (ii) enhance the participation of international research institutions, National Laboratories and R&D companies in EMI conferences and technical committees; (iii) promote engineering mechanics workshops and trainings on theoretical, numerical and experimental methods developed by EMI members; (iv) coordinate trainings and professional development activities at EMI conferences, e.g., peer-review of research/teaching/service statements for job/tenure/promotion applications, use of augmented reality or virtual reality in the classroom, GitHub best practices, safe space training; (v) support mentoring activities within EMI, e.g., by setting up mentor-mentee pairing mechanisms with committee chairs, seeking mentor matches across committees, and sharing conversation ground rules; (vi) lead efforts towards the creation of an open-access platform of peer-reviewed engineering mechanics educational contents for students and instructors, which could complement the resources available in stand-alone university curricula and the databases curated by individual researchers, and make trusted content easily searchable and accessible.

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<sup>1</sup> Education Resources Repository of the EMI Poromechanics Committee: <https://emi-poromechanics.github.io/>

<sup>2</sup> Conference: Engineering Mechanics Education Workshop, June 2023, NSF Grant 2321215, Lead-PI: C. Arson, Co-PI: M.J. Qomi