Ann Sychterz, PhD *(she/her)*

Assistant Professor, Civil and Environmental Engineering
Faculty Affiliate, Mechanical Science and Engineering
Faculty Affiliate, National Center for Supercomputing Applications
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SUMMARY

A manifestation of sustainability in infrastructure is the efficient use of material and energy required in the manufacturing process. Adaptive structures show promise to address challenges for structures currently being overdesigned and unmodifiable our ever-changing environment. Emerging technologies for civil engineering structures combine sensing with machine learning, machine vision, augmented computational design which includes form-finding methods, structural dynamics, statistical diagnostic tools, robotics, natural hazard assessment on infrastructure, and multi-scale experimental testing.

WORK EXPERIENCE

Assistant professor, civil engineering, structures group, University of Illinois Urbana-Champaign, Urbana, Illinois, United States, 01/2020 – current. https://sychterz.illinois.edu

- Structural health monitoring of demountable resilient modular infrastructure using active control
- Smart infrastructure inspired by nature for shape, vibration control, and life-cycle performance that is user and environmental hazard-aware
- Experimental work on a full-scale structures using big data and comparison with model-based and numerical approaches using multidisciplinary approaches from material science, applied mathematics, structural, mechanical, and electrical engineering

EDUCATION

Doctoral of Sciences, civil engineering with Dr. Ian F.C. Smith, Swiss Federal Institute of Technology Lausanne, Switzerland, 09/2014 – 08/2018

Biomimetic adaptive control of a deployable tensegrity structure

- Robotic control of structure shape using cables connected to motors for active folding and damage tolerance;
- Comparison of simulations using form-finding and measurements of a ¼-scale (tensegrity) footbridge composed of pin-jointed struts and cables, geometrically nonlinear, and held in a state of self-stress;
- Improve upon current analyses through investigation of cable friction, joint eccentricities, and strut contact;
- Employ and assess control strategies that ensure deployment, enhance current active control algorithms for better performance;
- Assess damage and dynamic loading scenarios through linear and non-linear dynamics;
- Locate damage through analysis of response, implement active control algorithms for damage mitigation;

Masters of Applied Science, civil engineering with focus on structural dynamics with Dr. Sriram Narasimhan and Dr. Scott Walbridge, University of Waterloo, Waterloo, ON, 09/2012 – 08/2014

Vibration characterization of aluminium pedestrian bridges

- Extracting natural frequencies, mode shapes, and modal damping properties of various full-scale specimens using signal-processing methods on acceleration data;
- Validation of practices in conjunction with finite element models;
- Code review of dynamic design of bridges

Bachelor of Applied Science, Civil Engineering Co-operative Program with honours with Structural Engineering Certificate, University of Waterloo, Waterloo, ON, 09/2007 – 04/2012

AWARDS

SEI Futures Fund Young Professionals Award, American Society of Civil Engineering, 01/2023
Office of Risk Management & Insurance Research faculty fellowship, Gies College of Business, 07/2021
Levenick Sustainable Teaching fellowship, Institute for Sustainability, Energy, and Environment, 02/2021
Faculty Fellow, National Center for Supercomputing Applications, 09/2020

FUNDING

Total funding: $1,902,000 Sychterz portion: $1,094,000

CIRCLE: Center for Infrastructure Resilience in Cities as Livable Environments	Dynamic Research Enterprise for Multidisciplinary Engineering Sciences	2023-2025	$300,000
Monitoring Bridge Health and Optimizing Inspections	Illinois Department of Transportation	2023-2024	$385,248
NSF ECI CMMI-2207296 “Collaborative Research: Analyzing Deployable Torque-Activated Structural Mechanisms for Enhanced Tension Capacity of Geosystems”	National Science Foundation	2022 -2024	$484,665
Unmanned Ground Vehicle for asphalt and concrete road and bridge deck health monitoring	UIUC Grainger Small Equipment Grant	2022	$89,662
“Bridge deck rapid assessment using AI structural sensing and augmented reality”	Discover Partners Institute	2021-2023	$125,000
“R27-244 Improved Geotechnical Site Characterization Using Measurement While Drilling” (co-PI)	Illinois Center of Transportation	2021-2024	$550,000
Levenick Sustainability Faculty Fellow	Institute for Sustainability, Energy, and Environment	2021-2022	$1,000
Office of Risk Management & Insurance Research faculty fellowship	Gies College of Business	2021-2022	$20,000
Campus as a Living Lab, (Lead-PI)	Institute for Sustainability, Energy, and Environment	2020-2021	$30,000
NCSA Faculty Fellow	National Center for Super Computing Applications	2020-2021	$25,000
Early Postdoc.Mobility fellowship	Swiss National Science Foundation	2019	$70,000

PREVIOUS WORK EXPERIENCE

Postdoctoral fellow, with Prof. Evgueni Filipov, University of Michigan, Ann Arbor, MI 02/2019 – 12/2019
Designing new topologies for active control by combining origami and tensegrity structures
Postdoctoral researcher, University of Waterloo, Waterloo ON 11/2018 – 01/2019
Created course content for new low-carbon buildings and intelligent infrastructure
Structural Designer, MMM Group, Thornhill ON 01/2011 – 05/2011
Designed and analyzed BIM model of steel frame buildings, reinforced concrete buildings, and timber structures via hand calculations and finite element models
Building Design Engineering Co-op, Corche Technical Services Inc., Kitchener, ON 01/2009 – 05/2009, 04/2008 – 09/2008

Designed architectural, electrical, and HVAC plans for multiple fit-ins of North Building of Toronto Congress Centre using AutoCAD MEP 2009 and TRACE to engineer properly sized equipment

Civil Engineering Assistant, The Walter Fedy Partnership, Kitchener ON 05/2010– 09/2010, 05/2012-05/2013

Completed detailed calculations for stormwater management systems such as underground storage and ponds using groundwater runoff modelling and engineering design parameters

Undergraduate Student Research Assistant, University of Waterloo, Waterloo ON 08/2011 – 08/2012

Modelled effects of surface and subsurface railway vibrations on structures using Abaqus

MENTORING EXPERIENCE

Doctoral candidates, Sagnik Paul, Angshuman Baruah, and Juan Torres
Masters candidates, Heather Gathman, Kaylee Tucker, Matt Grendzinski
Masters semester project, Mohamed Mohamed Abshir, University of Illinois Urbana-Champaign, 2020
Ginette Siani, Johanna Isaksson, Levy Sharabi, Jacob Ritchie, Prajwal Arunachala, Vivek Kumar, EPFL, Lausanne, Switzerland, 2014-2017
Bachelor laboratory assistants, Sofia Tovar de Leon, Hongjie Luo, Shizhao Xu, Tu Huyhn, University of Illinois Urbana-Champaign, 2020.
Kevin Goorts, Stan Fong, Melissa Jennings, Laura Luna, University of Waterloo, Waterloo, Canada, 2012-2014

TEACHING EXPERIENCE

CEE 498 Theory and Creation of Structure, professor, University of Illinois Urbana-Champaign, Urbana, Illinois, 08/2022
CEE 595 SUS, Sustainable and Resilient Infrastructure Systems seminar, professor, University of Illinois Urbana-Champaign, Urbana, Illinois, 08/2021 - present
CEE 467 Masonry Structures, professor, University of Illinois Urbana-Champaign, Urbana, Illinois, 06/2021
CEE 465 Design of structural systems, professor, University of Illinois Urbana-Champaign, Urbana, Illinois, 01/2020 – Present
Civil 260 Computer-aided engineering for civil engineers, teaching assistant, EPFL, Lausanne, Switzerland, 02/2015 – 09/2018
CIVE 265 Structure and properties of materials, teaching assistant, University of Waterloo, Waterloo, Canada, 09/2013 – 12/2013
CIVE 403 Structural analysis 2, teaching assistant, University of Waterloo, Waterloo, Canada 01/2013 – 05/2013
CIVE 405 Structural dynamics, teaching assistant, University of Waterloo, Waterloo, Canada, 01/2013 – 05/2013, 01/2014 – 05/2014

PROFESSIONAL AFFILIATIONS

Professional Engineers of Ontario, member since 06/2012
International Association for Shell and Spatial Structures, member since 04/2015
Canadian Society of Civil Engineering, 081492, member since 09/2010
American Society of Civil Engineering, 9432728, member since 09/2012
American Institute for Aeronautics and Astronautics, member since 2019
American Society of Mechanical Engineers, member since 2020
Society of Women Engineering, member since 2021

COMMUNITY SERVICE

Editorial Service

Guest Editor, “Sensor Systems and Resiliency Diagnostics for Spatial Infrastructure”, Frontiers in Built Environment (Structural Sensing)
Special Issue Editor, “Adaptive and intelligent systems in structural engineering” ASCE Journal of Structural Engineering

Technical Committees
Treasurer, webinar organizer, ASCE SEI Structural Control and Sensing TAC
Committee member, ASCE EMI Structural Dynamics TAC
Committee member, ASCE EMI Experimental Analysis and Instrumentation TAC
Committee member and student competition judge, ASCE EMI Structural Health Monitoring TAC
Committee member, Bridges and Foundations TAG, Illinois Department of Transportation

Departmental Service
Organizer, Womxn Exploring Graduate Opportunities in Civil and Environmental Engineering (We Go CEE), 2021 - current
UIUC Structures Conference, committee member, 2020 – current
Structures Group Graduate Travel Fellowship, committee member, 2020 – current
Masonry Arch competition, faculty mentor, 2021 – current

College Service
Worldwide Youth in Science and Engineering (WYSE) camp – Camp faculty organizer, University of Illinois, 2021
Worldwide Youth in Science and Engineering (WYSE) camp – Module coordinator, "Deployable and Self-Balancing Structures), University of Illinois, 2020

Institution Service
Kerbis Lempp endowed chair search committee, Dept of Civil Engineering representative for the School of Architecture, 2021

Conference Organization
Session chair, General CSCE Session 13,14&15 and French session for CSCE 2021 virtual annual conference
Mini-Symposia Coordinator, MS74 – Adaptive and Controllable Modular Structures for ASCE Engineering Mechanics Institute International Conference 2021 in Durham, UK
Mini-Symposia Coordinator, MS-257 – Adaptive and Controllable Modular Structure for ASCE EMI/PMC 2020, Columbia University, NY
Logistics Coordinator, European Group for Intelligent Engineering in Computing conference EG-ICE 2018, Lausanne, Switzerland.

LANGUAGE EXPERIENCE
Fluent (bilingual) English and French, preliminary German

PUBLICATIONS

Journal papers

Gathman, H.F. and **A.C. Sychterz,** Design and analysis of an aluminum plate-based tensegrity canopy as a bike parking shelter, Journal of the International Association for Shell and Spatial Structures, 2023, doi.org/10.20898/j.iass.2023.003

Baruah, A.C and **Sychterz A.C**., Assessment and comparison of cable-actuation of pill bug inspired adaptive origami structure using computer vision and dynamic relaxation, Frontiers in Built Environment 2021, https://www.frontiersin.org/articles/10.3389/fbuil.2022.813543/full

Sychterz A.C., Bernardi, I., Tom, J.G., and Beemer, R.D., Nonlinear soil-structure behavior of a deployable and compliant anchor system, Canadian Journal of Civil Engineering, (*In Review*), 2021.

Sychterz A.C. and Baruah A.C., Active Control for Adaptive Origami Structures Undergoing Damage, Engineering Structures, 24,10.1016/j.engstruct.2021.112457, 2021, 1—9.

Sychterz, A.C. and Smith, I.F.C., Damage mitigation of near-full-scale deployable tensegrity structure through behavior biomimetics, Journal of Structural Engineering, 146 (1), 10.1061/(ASCE)ST.1943-541X.0002470, 2020.

Sychterz, A.C. and Smith, I.F.C., Deployment and shape change of a tensegrity structure using path-planning and feedback control, Frontiers in Built Environment, 10.3389/fbuil.2018.00045*,* 2018.

Sychterz, A.C. and Smith, I.F.C., Using dynamic measurements to detect and locate ruptured cables on a tensegrity structure, Engineering Structures, 173 (10), 10.1016/j.engstruct.2018.06.083, 2018, 631—642.

Veuve, N., **Sychterz, A.C.,** and Smith, I.F.C., Active control of a deployable tensegrity structure, Engineering Structures, 152, 10.1016/j.engstruct.2017.08.062, 2017, 14—23.

Bel Hadj Ali, N., **Sychterz A.C.,** and Smith I.F.C., A dynamic-relaxation formulation for analysis of cable structure with slide-induced friction, Journal of Solids and Structures, 126-127, 10.1016/j.ijsolstr.2017.08.008, 2017,P 240—251.

Sychterz, A.C. and Smith I.F.C., Joint friction during deployment of a near-full-scale tensegrity footbridge, Journal of Structural Engineering, 143 (9), 2017, 1—9.

Dey, P., **Sychterz, A.C.,** Narasimhan, S., and Walbridge, S., Performance of pedestrian-load models through experimental studies on lightweight aluminum bridges, Journal of Bridge Engineering, 21 (8), 10.1061/(Asce)Be.1943-5592.0000824, 2016, 1—12.

Sychterz A.C., Schill, T. and Verspagen, B., Low-impact development measures of storm water management system at Conestoga College South Campus, Journal of Water Management Modeling, 10.14796/JWMM.C371, (2), 2014.

Conference Papers

Tucker, K, and **Sychterz, A.C.** “Comparison of biologically inspired functionally graded deployable geosystems with experimental measurements”, Proceedings of the International Association for Shell and Spatial Structures Congress, Melbourne, Australia, 2023, 1-10.

Sychterz, A.C. “Adaptive Aluminum Tensegrity Structure as a Bike Parking Canopy”, 5th International Conference on Structures & Architecture, Aalborg, 2022, 1–8.

Gathman, H and **Sychterz, A.C**. "Dynamic characterization and assembly methods of full-scale aluminum plate-based tensegrity structure", Canadian Society of Civil Engineers Annual Conference 2022, Whistler, British Columbia.

Tucker, K and **Sychterz, A.C**. "Analyzing Geosystems with Deployable Compliant Mechanisms for Enhanced Tension Capacity", Canadian Society of Civil Engineers Annual Conference 2022, Whistler, British Columbia.

Paul, S. and **Sychterz, A.C**. "Robustness of Multilayered Random-network Architected Material through Experimental Testing", ASCE Engineering Mechanics Institute Conference 2022, Baltimore, Maryland, USA

Torres, J.A. and **Sychterz, A.C**. "Virtual Reality as a Vehicle for Education in the Domains of Building Systems", American Society of Engineering Education Annual Conference and Exposition 2022, Minneapolis, MN

Baruah A.C. and **Sychterz A.C.** "Damage detection of cable-actuated origami structure using dynamic relaxation", Engineering Mechanics Institute Conference 2022, Baltimore, Maryland.

Gathman, H and **Sychterz A.C.** "Full-scale plate-based tensegrity bike parking canopy", Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium, Surrey, UK, 2021, 1—10.

Baruah, A.C. and **Sychterz A.C.** "Active control of 3D printed pill-bug inspired adaptive origami", Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium, Surrey, UK, 2021, 1—10.

Paul, S. and **Sychterz A.C.** "Dynamic Characterization of an Adaptive Tensegrity-based Four-Module Roof Structure", Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium, Surrey, UK, 2021, 1—10.

Gathman, H and **Sychterz A.C.** "Analysis of full-scale plate-based tensegrity structure using dynamic relaxation", Canadian Society for Civil Engineering Conference 2021, 1—8.

Baruah, A.C. and **Sychterz A.C.** "Pill-bug inspired adaptive origami tuned-mass dampers", Canadian Society for Civil Engineering Conference 2021, 1—8.

Paul, S. and **Sychterz A.C.** "A Computational Analysis for an Adaptive Tensegrity-based Four-Module Roof Structure", Canadian Society for Civil Engineering Conference 2021, 1—9.

Sychterz, A.C. and Smith, I.F.C., Path-finding for deployment and midspan connection of a tensegrity structure, Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium, Boston, United States, 2018.

Sychterz, A.C and Smith I.F.C., Dynamic effects of cable rupture in a tensegrity structure, Fourth conference on Smart Monitoring, Assessment and Rehabilitation of Civil Structures, Zürich, Switzerland, 2017, 1—8.

Sychterz, A.C. and Smith, I.F.C., Towards biomimetic actuation for a deployable structure, Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium, Tokyo, Japan, 2016, 1—9.

Sychterz, A.C. and Smith, I.F.C., Shape control for self-stress following deployment of a tensegrity footbridge, 24th International Workshop on Intelligent Computing in Engineering, Krakow, Poland, 2016, 1—11.

Sychterz, A.C., Dalil Safaei, S., and Smith, I.F.C., Friction modeling of a deployable tensegrity footbridge, Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium, Amsterdam, The Netherlands, 2015, 1—11.

Sychterz, A.C., Narasimhan, S., and Walbridge, S., A study on modal characterization and dynamic analysis of two aluminium pedestrian bridges in Québec, INALCO 2013 Conference Proceedings Montreal, Canada, 2013.

Sychterz A.C., Sadhu, A., Narasimhan, S., and Walbridge, S., Results from Modal Testing of the Daigneault Creek Bridge, CSCE 2013 General Conference Proceedings, Montreal, Canada, 2013.

Abstract-only Conferences

Paul, S and Sychterz A.C. Tensile Behavior of Multi-layered Randomized Architected Material (MLRAM), ASCE Engineering Mechanics Institute (EMI 2023), Atlanta, 2023.

Baruah, A.C. and Sychterz A.C. Cable-actuation of pill bug-inspired adaptive origami structure using computer vision, ASCE Structural Engineering Institute Structures Congress (SEI 2023), New Orleans, 2023.

Sychterz A.C. Adaptive Pill Bug Inspired Origami Tuned-Mass Dampers, Engineering Mechanics Institute (EMI/PMC 2021) Conference 2021, New York, 2021.

Sychterz A.C. Adaptive Lightweight Structures Inspired from Biology, Engineering Mechanics Institute (EMI-IC) International Conference 2020, Durham, United Kingdom, 2021.

Sychterz A.C. and Filipov, E., Actuator optimization for adaptive origami structures, 56th Annual Technical Meeting of the Society of Engineering Science (SES2019), St. Louis, MO, 2019.

Sychterz A.C. and Smith, I.F.C., Element location and classification following a damage event of a near-full-scale deployable tensegrity structure, Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium, Barcelona, Spain, 2019.

Sychterz A.C. and Smith, I.F.C., Damage mitigation of a near-full-scale deployable tensegrity structure through behavior biomimetics, Engineering Mechanics Institute (EMI) Conference 2019, Pasadena, United States, 2019.

INVITED SEMINARS

Sychterz, A.C. "Adaptive and deployable lightweight infrastructure", University of Texas at Austin, February 17, 2023.

Sychterz, A.C. "Adaptive and deployable lightweight infrastructure", Tufts University, November 4, 2022.

Sychterz, A.C. "Adaptive and deployable lightweight infrastructure", John Hopkins University, CEE seminar, April 28, 2022.

Sychterz, A.C. “Path-Planning for Large-Scale Shape-Changing Civil Structures”, University of Waterloo ArchEng seminar, April 14, 2022.

Sychterz, A.C., “Adaptive and deployable lightweight infrastructure”, University of Massachusetts Dartmouth civil seminar, December 10, 2021.

Sychterz, A.C., “Adaptive and deployable lightweight infrastructure”, University of Cambridge seminar, Cambridge, UK, November 15, 2021.

Sychterz, A.C., “Adaptive and deployable lightweight infrastructure”, Imperial College London structures seminar, London, UK, October 13, 2021.

Sychterz, A.C., “Harnessing unconventional and 3D printed materials for lightweight deployable infrastructure”, CEE Construction Materials seminar, Urbana, IL, March 10, 2021.

Sychterz, A.C., “Deployable lightweight structures”, Illinois Transportation and Highway Engineering Conference, Urbana, IL, March 4, 2021.

Sychterz, A.C., “Adaptive and deployable lightweight infrastructure”, Illinois Structural Engineering Conference 2021, Urbana, IL, February 19, 2021.

Sychterz, A.C., “Adaptive lightweight deployable structures as civil infrastructure”, Carnegie Mellon University, Advanced Infrastructure Systems group, February 12, 2021

Sychterz, A.C., “Adaptive deployable lightweight structures inspired from biology”, University of Waterloo, March 6, 2020.

Sychterz, A.C., “Adaptive deployable lightweight structures inspired from biology”, CEE595S Seminar Series, University of Illinois Urbana-Champaign, February 3, 2020.

Sychterz, A.C., “Damage mitigation of large-scale adaptive structures using biologically-inspired behavior”, Wang research group, University of Southern California, Los Angeles, CA January 17, 2020.

Sychterz, A.C., “Damage mitigation and resilience of a large-scale deployable tensegrity structure using biologically-inspired behavior”, Cornell University, Ithaca, NY, April 24, 2019.

Sychterz, A.C., “Damage mitigation and resilience of a large-scale deployable tensegrity structure using biologically-inspired behavior”, McMaster University, Hamilton, Canada, April 8, 2019.

Sychterz, A.C., “Industrialisation de la construction”, École de technologie supérieure, Montreal, Canada April 2, 2019.

Sychterz, A.C., “Damage mitigation and resilience of a large-scale deployable tensegrity structure using biologically-inspired behavior”, University of Nevada Las Vegas, Las Vegas, NV, March 21, 2019.

Sychterz, A.C., “Damage mitigation and resilience of a large-scale deployable tensegrity structure using biologically-inspired behavior”, Georgia Institute of Technology, Atlanta, GA, February 21, 2019.

Sychterz, A.C., “Damage mitigation and resilience of a large-scale deployable tensegrity structure using biologically-inspired behavior”, DSRL group seminar, University of Michigan, Ann Arbor, MI, February 7, 2019.

Sychterz, A.C., “Damage mitigation and resilience of a large-scale deployable tensegrity structure using biologically-inspired behavior”, University of Nevada Reno, Reno, NV, February 4, 2019.

Sychterz, A.C., “Damage mitigation and resilience of a large-scale deployable tensegrity structure using biologically-inspired behavior”, University of Victoria, Victoria, Canada, February 1, 2019.

Sychterz, A.C., “Damage mitigation and resilience of a large-scale deployable tensegrity structure using biologically-inspired behavior”, Wissenschaftlichen Kolloquim “Enterfen adaptiver Strukturen im Bauwesen”, Universität Stuttgart, July 13, 2018.