James P. Hambleton, Ph.D.

Assistant Professor
Department of Civil and Environmental Engineering
Northwestern University

I. Coordinates

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(iii) http://cgse.edu.au/research-team/james-hambleton

II. Biographical Details

Nationalities: American; Australian
Languages: English (native); Elementary French; Elementary Italian
Marital status: Married with two children

III. Education

Doctor of Philosophy in Civil Engineering (Geomechanics) 2007 - 2010
University of Minnesota, Minneapolis, USA
Thesis: *Plastic Analysis of Processes Involving Material-Object Interaction*
Adviser: Andrew Drescher, GPA: 4.0 out of 4.0

Master of Science in Civil Engineering (Geomechanics) 2005 - 2006
University of Minnesota, Minneapolis, USA
Thesis: *Modeling Test Rolling in Clay*
Adviser: Andrew Drescher, GPA: 4.0 out of 4.0

Bachelor of Civil Engineering (Structural Engineering) 2002 - 2005
University of Minnesota, Minneapolis, USA
Honors: High Distinction, GPA: 3.91 out of 4.0

IV. Positions Held

Assistant Professor	Northwestern University, USA	2016 - present
Conjoint Senior Lecturer	The University of Newcastle, Australia	2016 - present
Research Academic (Senior Lecturer)	The University of Newcastle, Australia	2011 - 2016
Research Associate (Lecturer)	The University of Newcastle, Australia	2010 - 2011
Casual Academic	The University of Newcastle, Australia	2011
Graduate Research Assistant	University of Minnesota, USA	2005 - 2010
Teaching Assistant	University of Minnesota, USA	2006 - 2009
Engineering and Design Intern	Barr Engineering Co., Minneapolis, USA	2005
Undergrad. Research Assistant	University of Minnesota, USA	2003 - 2005
Educator and Technician	4H Center for Youth Develop. (UMN)	2002 - 2005

V. Honors and Awards

<u>Honors</u>

US National Society (USNS) Delegate for the 6th International Young Geotechnical Engineers' Conference (iYGEC6) 2017

Invited participant for Global Young Scientists Summit, Singapore, Jan. 17-22, 2016 (selected as 1 of 10 across all fields of science and engineering by the Australian Research Council) 2015

University Representative, Australian Academy of Technological Science and Engineering (ATSE) 2015 Clunies Ross "Wonder of Extreme Science" event 2015

New Faces of Civil Engineering Honoree, American Society of Civil Engineers (ASCE) 2014

Simon and Claire Benson Award for Outstanding Undergraduate Achievement 2005

Research Awards

Nominated for Packard Foundation Fellowship for Science and Engineering 2017

Australian Research Council (ARC) Discovery Early Career Researcher Award 2015

Excellent Paper Award, Int. Assoc. for Comp. Methods and Advances in Geomechanics 2014

National Science Foundation International Research Fellowship (offered; not accepted) 2010

Neville G. W. Cook Award for Innovative Research in Geomechanics 2010

Teaching Awards

Nominated for the Newcastle University Postgraduate Students Association (NUPSA) Supervisor of the Year Award 2013

VI. Editorial Roles

Editorial Board Member, *Computers and Geotechnics* 2015 - present

Editorial Board Member, *Canadian Geotechnical Journal* 2016 - present

Reviewer for over 15 international journals 2010 - present

Proceedings of the Royal Society A
Géotechnique
Géotechnique Letters
Computers and Geotechnics
Journal of Geotechnical and Geoenvironmental Engineering (ASCE)
Journal of Engineering Mechanics (ASCE)
Canadian Geotechnical Journal
International Journal for Numerical and Analytical Methods in Geomechanics
Engineering and Computational Mechanics (ICE)
Soils and Foundations
International Journal of Physical Modelling in Geotechnics
Journal of Testing and Evaluation (ASTM)
International Journal of Rock Mechanics and Mining Sciences
Rock Mechanics and Rock Engineering
Journal of Terramechanics
International Journal of Geomechanics (ASCE)
Journal of Applied Mechanics (ASME)
…

Co-Editor, ARC Centre of Excellence for Geotechnical Science and Engineering Annual Report 2011 - 2015

Guest Co-Editor, "CGSE special issue" of *Australian Geomechanics* (December 2014) 2014

VII. Professional Memberships

American Society of Civil Engineers (ASCE) 2003 - present
Engineering Mechanics Institute 2007 - present
Geo-Institute 2009 - present

International Association of Computational Mechanics 2013 - present

International Society for Terrain-Vehicle Systems 2016 - present

American Rock Mechanics Association 2017 - present

Australian Geomechanics Society (AGS) 2010 - present
Minnesota Geotechnical Society 2006 - 2010

VIII. Professional Qualifications

Passed Fundamentals of Engineering (FE) exam administered by NCEES 2007

IX. Service Activities

Major Activities

National Committee Member, Australian Geomechanics Society (AGS) 2016
Elected Member, Faculty Board, Faculty of Engineering and Built Environment, The University of Newcastle 2014 - 2016
Chair, Australian Geomechanics Society (AGS) Newcastle Chapter 2014 - 2015
Young Geotechnical Professional Representative, AGS Newcastle Chapter 2010 - 2013
Committee Member, Classroom Advisory Subcommittee, University Senate, University of Minnesota 2007 - 2009

Minor Activities

Session Chair, US Rock Mechanics/Geomechanics Symposium 2012, 2017
Regrouping Committee, Dept. Civil and Environ. Eng., Northwestern University 2016 - 2017
Adviser, Engineers Without Borders (EWB) Challenge 2011 - 2012
University of Minnesota Supercomputing Institute instructor 2007
Outreach mini-course instructor, Dept. of Civil Eng., Univ. of Minn. 2006 - 2007
Science fair judge, St. Paul area schools and Hopkins High School 2006 - 2007

X. Teaching and Supervision

Subjects Taught

CIV_ENV 495, *Plasticity and Limit Analysis*, Northwestern University 2017
GEN_ENG 205-2, *Engineering Analysis 2*, Northwestern University 2017
CIVL 4660, *Final-Year Project*, The University of Newcastle 2012 - 2016
GENG 1803, *Introduction to Engineering Practice*, The University of Newcastle 2011 - 2015
CIVL 2280, *Geomechanics I*, The University of Newcastle 2014
CIVL 4830, *Stress and Finite Element Analysis*, The University of Newcastle 2011, 2012
CE 4301, *Soil Mechanics II*, University of Minnesota 2006, 2007, 2009
CE 5180, *Special Topics in Geomechanics*, University of Minnesota 2009

Graduate Students

Zhefei Jin, PhD, *(Thesis title TBD)* June 2020 (expected)
Ting Lu, MS, (*Thesis title TBD*) Dec. 2017 (expected)
Mircea Mihalache, (*Thesis title TBD*) Dec. 2017 (expected)
Kourosh Todeshkejoei, PhD, *Modelling installation of helical anchors in clay* Nov. 2017 (expected)
Elaheh Kashizadeh, MPhil, *Investigation of ploughing processes in sand* March 2016 (submitted)

Co-advised Graduate Students

Manuel Herduin, PhD, *Multidirectional loading characterisation on a shared suction anchor for wave energy converters* Aug. 2018 (expected)
Mason Crumpton, PhD, *Computational methods in limit analysis* Dec. 2017 (expected)
Anastasia Suchowerska, PhD, *Geomechanics of multi-seam longwall coal mining* July 2014

Honors/Final-Year Project Supervisions

Anastasia Nally, *Analytical modelling of wheel mobility in sand* 2016
David Graham, *Bearing capacity of foundations and pipelines on sand subjected to general loading* 2016

Georgia Halvorsen, *Predicting the tractive performance of off-road vehicles based on force resultant bearing capacity models* 2015
Adam Schouten, *Field studies on rutting induced by off-roach vehicles* 2015
Brody Merritt, *Calculation of passive earth forces using finite element limit analysis* 2015
Nicholas Souden, *Identification of flow patterns in fundamental earthmoving processes* 2015
James Sargeant, *Characterisation of soil strength and stiffness from indentations tests* 2015
Caitlin Le Bas, *Experimental analysis of slope failure in dry sand* 2015
Samuel Rooney, *Determination of material properties from indentation tests* 2014
Joshua Dever, *Assessing the strength of granular materials by drum rotation* 2014
Daniel Carter, *Capacity of mine safety berms* 2014
Mick Lambley, *Investigation of the relationship between installation torque and pullout capacity for helical anchors* 2013
Adam Hawkes, *Analysis of flow patterns induced by objects of varying shape moving through sand* 2013
Brendan Somerville, *Mesh generation for limit analysis based on rigid block mechanisms* 2013
Anthony Shaw, *Novel methods for evaluating the strength of granular material* 2012
Mark Fischer, *Analysis of soil-wheel interaction* 2012
Tristan Rossiter, *Investigation of ploughing process in dry sand* 2012
Michael Monroe, *Analysis of shear band propagation in slopes based on linear elastic fracture mechanics* 2012

XI. Publications

Book Chapters

B1. Munoz, J.J., Hambleton, J. P., & Sloan, S.W. (2017). R-adaptivity in limit analysis. In A. Cocks, O. Barrera, & A. Ponter (Eds.), *Direct Methods of Structural Analysis*. New York: Springer. (In press).

Journal Papers

J1. Zhao, L., Gaudin, C., O'Loughlin, C. D., Hambleton, J. P., Cassidy, M. J., & Herduin, M. (2017). Suction caisson capacity in sand under inclined loading. *Canadian Geotechnical Journal*, (Under review).
J2. Hambleton, J. P., & Stanier, S. A. (2017). Predicting wheel forces using bearing capacity theory for general planar loads. *International Journal of Vehicle Performance*, 3(1), 71-88. **(Invited for special issue on "Mobility of Off-Road Vehicles")**
J3. Stanier, S. A., Dijkstra, J., Leśniewska, D., Hambleton, J. P., White, D. J., & Muir Wood, D. (2016). Vermiculate artefacts in image analysis of granular materials. *Computers and Geotechnics*, 72, 100-113.
J4. Hambleton, J. P., Sloan, S. W. (2016). A simplified kinematic method for 3D limit analysis. *Applied Mechanics and Materials*, 846, 342-347.
J5. Suchowerska, A. M., Carter, J. P., & Hambleton, J. P. (2016). Geomechanics of subsidence above single and multi-seam coal mining. *Journal of Rock Mechanics and Geotechnical Engineering*, 8(3), 304-313.
J6. Yu, S. B., Hambleton, J. P., & Sloan, S. W. (2015). Undrained uplift capacity of deeply embedded strip anchors in non-uniform soil. *Computers and Geotechnics*, 70, 41-49.
J7. Hambleton, J. P., Stanier, S. A., White, D. J., & Sloan, S. W. (2014). Modelling ploughing and cutting processes in soils. *Australian Geomechanics*, 49(4), 147-156.
J8. Hambleton, J. P., Stanier, S. A., Gaudin, C., & Todeshkejoei, K. (2014). Analysis of installation forces for helical piles in clay. *Australian Geomechanics*, 49(4), 73-79.
J9. Gaudin, C., O'Loughlin, C. D., Randolph, M. F., Cassidy, M. J., Wang, D., Tian, Y., Hambleton, J. P., & Merifield, R. S. (2014). Advances in offshore and onshore anchoring solutions. *Australian Geomechanics*, 49(4), 59-71.
J10. Yu, S. B., Hambleton, J. P., & Sloan, S. W. (2014). Analysis of inclined strip anchors in sand based on the block set mechanism. *Applied Mechanics and Materials*, 553, 422-427.
J11. Hambleton, J. P., & Sloan, S. W. (2013). A perturbation method for optimization of rigid block mechanisms in the kinematic method of limit analysis. *Computers and Geotechnics*, 48, 260-271.

J12. Hambleton, J. P., Buzzi, O., Giacomini, A., Spadari, M., & Sloan, S. W. (2013). Perforation of flexible rockfall barriers by normal block impact. *Rock Mechanics and Rock Engineering*, 46(3), 515-526. **(Invited paper, 1 of 14, 46th US Rock Mechanics/Geomechanics Symposium)**

J13. Hambleton, J. P., & Drescher, A. (2012). Approximate model for blunt objects indenting cohesive-frictional materials. *International Journal for Numerical and Analytical Methods in Geomechanics*, 36(3), 249-271. **(Excellent Paper Award, International Association for Computer Methods and Advances in Geomechanics)**

J14. Spadari, M., Giacomini, A., Buzzi, O., & Hambleton, J. P. (2012). Prediction of the bullet effect for rockfall barriers: a scaling approach. *Rock Mechanics and Rock Engineering*, 45(2), 131-144.

J15. Abbo, A. J., Lyamin, A. V., Sloan, S. W., & Hambleton, J. P. (2011). A C2 continuous approximation to the Mohr–Coulomb yield surface. *International Journal of Solids and Structures*, 48(21), 3001-3010.

J16. Hambleton, J. P., & Drescher, A. (2009). On modeling a rolling wheel in the presence of plastic deformation as a three- or two-dimensional process. *International Journal of Mechanical Sciences*, 51(11-12), 846-855.

J17. Hambleton, J. P., & Drescher, A. (2009). Modeling wheel-induced rutting in soils: Rolling. *Journal of Terramechanics*, 46(2), 35-47.

J18. Hambleton, J.P., & Drescher, A. (2008). Modeling wheel-induced rutting in soils: Indentation. *Journal of Terramechanics*, 45(6), 201-211.

Conference Papers

C1. Hambleton, J. P. Earthmoving through the lens of geotechnical engineering. *Proceedings of the 6th International Young Geotechnical Engineers' Conference (iYGEC6)*, Seoul, Korea, Sept. 17-22, (Accepted).

C2. Graham, D., Shi, Z., Hambleton, J. P., & Kouretzis, G. K. (2017). Limit loads for pipelines and cylinders partially embedded in frictional materials, Proc. *51st US Rock Mechanics/Geomechanics Symposium*, San Francisco, USA, June 25-28, (Accepted).

C3. Herduin, M., Gaudin, C., Cassidy, M., O'Loughlin, C., & Hambleton, J. P. (2016). Multi-directional load cases on shared anchors for arrays of floating structures, *Proc. 3rd Asian Wave and Tidal Energy Conference*, Singapore, Oct. 24-28.

C4. Todeshkejoei, C,. Hambleton, J. P., Stanier, S. A., & Gaudin, C. (2014). Modelling installation of helical anchors in clay. *Proc. 14th International Conference of the International Association for Computer Methods and Advances in Geomechanics*, Kyoto, Japan, Sept. 22-25, pp. 917-922.

C5. Kashizadeh, E., Hambleton, J. P., & Stanier, S. A. (2014). A numerical approach for modelling the ploughing process in sands. *Proc. 14th International Conference of the International Association for Computer Methods and Advances in Geomechanics*, Kyoto, Japan, Sept. 22-25, pp. 159-164.

C6. Suchowerska, A. M., Carter, J. P., & Hambleton, J. P. (2014). Prediction of roof collapse for rectangular underground openings. *Proc. AusRock 2014: Third Australasian Ground Control in Mining Conference*, Sydney, Australia, Nov. 5-6, pp. 367-374.

C7. Suchowerska, A. M., Carter, J. P., Hambleton, J. P., & Merifield, R. M. (2014). Effect of constitutive behaviour of strata on the prediction of subsidence above single-seam and multi-seam supercritical longwall panels. *Proc. 9th Triennial Conference on Mine Subsidence*, Pokolbin, Australia, May 11-13, Vol. 1, pp. 149-168.

C8. Hambleton, J. P., Buzzi, O., Giacomini, A., Spadari, M., & Sloan, S. W. (2012). Perforation of rockfall protection barriers by normal block impact. *Proc. 46th US Rock Mechanics/Geomechanics Symposium*, Chicago, USA, June 24-27, Vol. 2, pp. 1413-1419.

C9. Hambleton, J.P., & Sloan, S.W. (2011). Coordinate perturbation method for upper bound limit analysis. *Proc. 2nd International Symposium on Computational Geomechanics*, Cavtat-Dubrovnik, Croatia, Apr. 27-29, pp. 373-384.

C10. Hambleton, J. P., Sloan, S. W., Pyatigorets, A. V., & Voller, V. R. (2011). Lower bound limit analysis using the Control Volume Finite Element Method. *Proc. 13th International Conference of the*

International Association for Computer Methods and Advances in Geomechanics, Melbourne, Australia, May 9-11, Vol. 1, pp. 88-93.

C11. Drescher, A., & Hambleton, J. P. (2010). Geotechnics and Terramechanics. *Proc. UMN 58th Annual Geotechnical Engineering Conference*, St. Paul, USA, Feb. 26, pp. 23-31.

C12. Hambleton, J. P., & Drescher, A. (2009). Asymptotics in soil-wheel interaction. *Proc. International Symposium on Computational Geomechanics*, Juan-les-Pin, France, Apr. 29-May 1, pp. 967-976.

C13. Hambleton, J. P., & Drescher, A. (2008). Soil damage models for off-road vehicles. *Proc. Geocongress 2008, Geosustainability and Geohazard Mitigation*, New Orleans, USA, Mar. 9-12, ASCE Geotechnical Special Publication No. 178, pp. 562-569.

C14. Hambleton, J. P., & Drescher, A. (2008). Mechanistic approach for relating test roller penetration to mechanical properties of bases and subgrades. *Transportation Research Board 87th Annual Meeting Compendium of Papers*, Washington, D.C., USA, Jan. 13-17.

C15. Hambleton, J. P., & Drescher, A. (2007). Modeling test rolling on cohesive subgrades. *Proc. International Conference on Advanced Characterisation of Pavement and Soil Engineering Materials*, Athens, Greece, June 20-22, Vol. 1, pp. 359-368.

C16. Eggen, M., Hambleton, J. P., Mantell, S. C., & Davidson, J. H. (2005). Mechanical behavior of random fiber composite perforated plates. *Proc. American Society for Composites 20th Technical Conference*, Philadelphia, USA, Sept. 7-9, pp. 84-96.

Special Publications

S1. Hambleton, J. P, Kouretzis, G. P, & Sloan, S. W. (2014). Introduction to the CGSE Special Issue of Australian Geomechanics. *Australian Geomechanics*, 49(4), 1-2.

S2. Drescher, A., & Hambleton, J. P. (2010). Modeling a rolling wheel on soil. *University of Minnesota Supercomputing Institute Research Bulletin*, 26(1), 1-4.

S3. Hambleton, J. P., & Drescher, A. (2008). *Development of Improved Test Rolling Methods for Roadway Embankment Construction, Final Report*. Minnesota Dept. of Transportation, Research Services Section, St. Paul.

Conference Presentations (Abstracts)

P1. Shi, Z., & Hambleton, J. P. (2017). An automated upper bound approach for three-dimensional limit analysis. *Engineering Mechanics Institute Conference (EMI 2017)*, San Diego, USA, June 4-7, 2017.

P2. Hambleton, J. P., & Sloan, S. W. (2015). A simplified kinematic method for 3D limit analysis. *2nd Australasian Conference on Computational Mechanics*, Brisbane, Australia, Nov. 30-Dec. 1. **(Keynote lecture)**

P3. Hambleton, J. P., & Kashizadeh, E. (2013). A numerical approach for modeling evolutionary problems in geomechanics. *Engineering Mechanics Institute Conference*, Evanston, IL, USA, Aug. 4-7.

P4. Hambleton, J. P., & Kashizadeh, E. (2013). Simulation of ploughing and cutting in soils by incremental limit analysis. *12th U.S. National Congress on Computational Mechanics*, Raleigh, NC, USA, July 22-25.

P5. Hambleton, J. P., & Drescher, A. (2008). On modeling a rolling wheel as a two- or three-dimensional process. *Symposium on Advances in Contact Mechanics*, Delft, The Netherlands, Oct. 22-24.

P6. Hambleton, J. P., & Drescher, A. (2008). Modeling processes involving soil-wheel interaction. *8th International Workshop on Bifurcations and Degradations in Geomaterials* (IWBDG2008), Lake Louise, Canada, May 28-31.

P7. Hambleton, J. P., & Drescher, A. (2008). Modeling deep wheel penetration in frictional/cohesive soils. *Inaugural International Conference of the Engineering Mechanics Institute*, Minneapolis, USA, May 18-21.

XII. Invited Talks

T1. *Modeling evolutionary plasticity problems in geomechanics*. University of Illinois at Chicago, USA, April 21, 2017.

T2. *Modeling plowing and cutting processes in soils*. Queen's University, Kingston, Canada, April 5, 2017.
T3. *Mobility analysis based on bearing capacity theory for general planar loads*. The University of Western Australia, Perth, Australia, April 29, 2016.
T4. *Modeling evolutionary plasticity problems in geomechanics*, Headquarters of Caterpillar, Inc., Peoria, IL, USA, May 2, 2016.
T5. *Modeling evolutionary plasticity problems in geomechanics*, Northwestern University, Evanston, IL, USA, February 10, 2016.
T6. *Ploughing and cutting in soils: Modelling and applications*. The University of Western Australia, Perth, Australia, November 15, 2013.
T7. *Modelling processes involving material-object interaction*. Headquarters of Caterpillar, Inc., Peoria, IL, USA, June 29, 2012.
T8. *Modelling the evolutionary problem of an object interacting with a plastically deforming surface*. The University of Sydney, Sydney, Australia, October 13, 2011.
T9. *Modelling the evolutionary problem of an object interacting with a plastically deforming surface*. CSIRO, Australian Resources Research Centre, Perth, Australia, August 12, 2011.
T10. *A coordinate perturbation method for optimizing collapse mechanisms in upper bound limit analysis*. CSIRO, Earth Science and Resource Engineering, Melbourne, Australia, May 13, 2011.
T11. *Incremental approach for modeling indentation and rolling processes on rigid-plastic material*. Cook Award Lecture, Department of Civil Engineering, University of Minnesota, Minneapolis, USA, May 7, 2010.
T12. *On three- and two-dimensional analysis of a wheel rolling on a plastic surface*. Institute for Geotechnical Engineering, ETH Zurich, Switzerland, April 27, 2009.
T13. *Theoretical models for machine-soil interaction*. Naval Research Laboratory, Stennis Space Center, USA, February 9, 2009.
T14. *Modeling a wheel on an elastoplastic surface*. Itasca Consulting Group, Minneapolis, USA, October 14, 2008.
T15. *Modeling soil-wheel interaction*. IWBDG2008 Post Workshop at headquarters of Caterpillar, Inc., Peoria, USA, June 2, 2008.
T16. *Research and reflections of a geomechanics graduate student*. ASCE Brown Bag Presentation, Minneapolis, USA, April 21, 2008.

XIII. Major Research Proposals

1. *Dynamic shear band propagation mechanisms of tsunamigenic landslides*

Investigators:	James Hambleton, University of Minnesota (Principal Investigator) Alexander Puzrin, ETH Zurich (Host)
Funding body:	National Science Foundation, International Research Fellowship Program
Funding request:	$144,160 (USD)
Funding period:	2010 - 2012
Status:	Offered; not accepted

2. *Harnessing the power of oceans: Anchors for floating energy devices*

Investigators:	Christophe Gaudin, The University of Western Australia Mark Cassidy, The University of Western Australia Conleth O'Loughlin, The University of Western Australia James Hambleton, The University of Newcastle
Funding body:	Australian Research Council, Discovery Project
Funding request:	$742,922 (AUD)
Funding awarded:	$571,800 (AUD)
Funding period:	2015 - 2017
Status:	Awarded

3. *Innovating earthmoving mechanics for next-generation infrastructure*

Investigators:	James Hambleton, The University of Newcastle
Funding body:	Australian Research Council, Discovery Early Career Researcher Award
Funding request:	$400,733 (AUD) ARC + $358,585 (AUD) institutional support
Funding awarded:	$354,225 (AUD) ARC + $358,585 (AUD) institutional support
Funding period:	2016 - 2018
Status:	Awarded; relinquished upon relocating to US

4. *Learning efficiency in earthmoving from nature's civil engineers*

Investigators:	James Hambleton, Northwestern University
Funding body:	Packard Foundation Fellowship for Science and Engineering
Funding request:	$875,000 (USD)
Funding period:	2017 - 2022
Status:	Under review

5. *Unlocking efficiencies in earthmoving for future infrastructure: Modeling plowing and cutting processes in soils*

Investigators:	James Hambleton, Northwestern University (PI) Paul Umbanhowar, Northwestern University (co-PI)
Funding body:	National Science Foundation
Funding request:	$175,205 (USD)
Funding period:	2017-2018
Status:	Awarded