# Curriculum Vitae – Nicholas Anton Collins-Craft

## Education

Doctor of Philosophy/Doctorat from the University of Sydney and École nationale des ponts et chaussées (2015 – 2019).
Advisors: Jointly supervised under a cotutelle agreement by Professor Itai Einav (Sydney), Professeur Jean Sulem and Dr Ioannis Stefanou (ENPC).
Thesis title: *The effect of evolving micro-structural length scale on the macroscopic constitutive behaviour of granular media.* Defended the 22nd of November, 2019.

Bachelor of Engineering in Civil Engineering with First Class Honours and the University Medal from the University of Sydney (2011 – 2014).
Honours Thesis advisor: Professor Itai Einav.
Thesis title: *The Contribution of Granular Rotation to Improving the Efficiency of Heat Transfer.*

Certificate of Advanced Engineering from the University of Sydney (2011 – 2014)
Undertaken as an extension programme in parallel with the Bachelor's Degree, enabling high-achieving students to work on projects in humanitarian engineering, educational outreach and product commercialisation.

Higher School Certificate at North Sydney Boys High School (2005 – 2010)

## Academic Employment

September 2022 – present Marie Skłodowska-Curie Actions Postdoctoral Fellow in the Tripop team at the Inria Centre of the Université Grenoble Alpes, financed by the project LEMMA (Landslide and avalanchE Mechanics with Multiphysical datA), in collaboration with Dr Vincent Acary (Inria), Dr Franck Bourrier (Inrae & Inria) and Professor Johan Gaume (WSL & ETH Zürich).

November 2020 – August 2022 Postdoctoral researcher in the Tripop team at the Inria Centre of the Université Grenoble Alpes, financed by the Region Auvergne-Rhône-Alpes project SMART-PROTECT, supervised by Dr Vincent Acary and Dr Franck Bourrier, in collaboration with industrial partner Géolithe.

June 2015 – November 2019 Doctoral student at the University of Sydney and École nationale des ponts et chaussées, financed by an Australian Postgraduate Award and a University of Sydney Merit top-up scholarship.

## Publications

On the formulation and implementation of extrinsic cohesive zone models with contact
N.A. Collins-Craft, F. Bourrier & V. Acary, in Computer Methods in Applied Mechanics and Engineering, Volume 400, October 2022.

A Cosserat Breakage Mechanics model for brittle granular media
N.A. Collins-Craft, I. Stefanou, J. Sulem & I. Einav, in the Journal of the Mechanics and Physics of Solids, Volume 141, August 2020.

**Conference Presentations**

A non-smooth extrinsic cohesive zone model including contact and friction, N.A. Collins-Craft, F. Bourrier & V. Acary, The Seventh International Conference on Computational Modelling of Fracture and Failure of Materials and Structures, Prague, Czechia, 21/06/2023 – 23/06/2023.

A non-smooth cohesive zone model for rock fracture and contact, N.A. Collins-Craft, F. Bourrier, J. Gaume & V. Acary, European Geophysical Union General Assembly 2023, Vienna, Austria, 23/04/2023 – 28/04/2023.

A non-smooth formulation of an extrinsic cohesive zone model with contact and friction, N.A. Collins-Craft, F. Bourrier & V.Acary, 11th European Solid Mechanics Conference, Galway, Ireland, 04/07/2022 – 08/07/2022.

An extrinsic cohesive zone model with contact and friction, N.A. Collins-Craft, F. Bourrier & V.Acary, 18th European Mechanics of Materials Conference, Oxford, United Kingdom, 04/04/2022 – 06/04/2022.

An extrinsic cohesive zone model with contact developed in the non-smooth mechanics framework, N.A. Collins-Craft, F. Bourrier & V. Acary, 33rd Nordic Seminar on Computational Mechanics, Jönköping, Sweden, 25/11/2021 – 26/11/2021.

Unifying Breakage Mechanics with the Cosserat continuum to predict shear band localisation, N.A. Collins-Craft, I. Stefanou, J. Sulem & I. Einav, International Congress of Theoretical and Applied Mechanics 2020+1, Milan, Italy, 22/08/2021 – 27/08/2021.

A theory to predict shear band formation in granular media with evolving grain size distributions, N.A. Collins-Craft, I. Stefanou, J. Sulem & I. Einav, Micro2Macro 2018, Reggio Calabria, Italy, 29/05/2018 – 01/06/2018.

A formulation of Breakage mechanics in the Cosserat continuum to predict shear band formation in granular media, N.A. Collins-Craft, I. Stefanou, J. Sulem & I. Einav, 12th EURO-conference on Rock Physics & Geomechanics, Ma'ale HaHamisha, Israel, 05/11/2017 – 10/11/2017.

**Accepted Conference Presentations**

Extending non-smooth contact mechanics to cohesive zone modelling, N.A. Collins-Craft, F. Bourrier & V. Acary, 7th International Conference on Computational Contact Mechanics, Turin, Italy, 05/07/2023 – 07/07/2023.

**Conference Posters**

The effect of grain size reduction on shear band formation, N.A. Collins-Craft, I. Stefanou, J. Sulem & I. Einav, Patterns in Geomechanics, Sydney, Australia, 29/01/2019 – 01/02/2019.

The effect of grain size reduction during shearing of granulated fault gouge, N.A. Collins-Craft, I. Stefanou, J. Sulem & I. Einav, AGU Fall meeting, Washington D.C., United States of America, 10/12/2018 – 14/12/2018.

Modelling crushable granular media in the Cosserat continuum, N.A.

Collins-Craft, I. Stefanou, J. Sulem & I. Einav, Navier Seminar, Paris, France, 05/03/2018.

Progress towards a constitutive model for crushable granular media using Cosserat continuum modelling, N.A. Collins-Craft, I. Stefanou, J. Sulem & I. Einav, ERC REALISM Kick-off Meeting, Paris, France, 15/03/2017.

**Invited Seminars**

La mécanique non-lisse pour la modélisation de la fissuration : principes, premiers résultats et perspectives, MISES seminar, Institut Jean le Rond d'Alembert, 08/03/2023.

Formulating and implementing extrinsic cohesive zone models in the non-smooth mechanics framework, CERMES seminar, École nationale des ponts et chaussées, 22/10/2022.

Predicting strain localisation in crushable granular media using the Cosserat continuum, TRIPOP seminar, Inria Grenoble-Rhône-Alpes, 07/12/2020.

A Cosserat Breakage Mechanics model for brittle granular media and An Introduction to Julia, CoQuake seminar, École centrale de Nantes, 02/06/2020.

The effect of evolving micro-structural length scale on the macroscopic constitutive behaviour of granular media, Granular Forum, the University of Sydney, 20/06/2018.

The effect of evolving micro-structural length scale on the macroscopic constitutive behaviour of granular media, CERMES seminar, École nationale des ponts et chaussées, 19/02/2018.

The effect of evolving micro-structural length scale on the macroscopic constitutive behaviour of granular media, ENS seminar, École normale supérieure de Paris, 03/03/2017.

**Seminars to Masters Students**

L'effet de l'evolution de l'échelle de longeur micro-structurel sur le comportement macroscopique constitutif des milieux granulaires, MSROE seminar, École nationale des ponts et chaussées, 11/01/2018. Approximately 30 students.

The effect of evolving micro-structural length scale on the macroscopic constitutive behaviour of granular media, MSROE seminar, École nationale des ponts et chaussées, 05/01/2017. Approximately 30 students.

**Software**

On the formulation and implementation of extrinsic cohesive zone models with contact. Codes accompanying the article of the same name that are sufficient to reproduce all simulations and figures in the paper.

Julia Constitutive Model Integration. Codes that use the Julia language to integrate the model described in "A Cosserat Breakage Mechanics Model for

Brittle Granular Media", as well as conduct linear stability analyses over given loading paths.

**Data**

On the formulation and implementation of extrinsic cohesive zone models with contact. The results of all simulations conducted in the article of the same name, as well as the finite element meshes used.

**Working Papers**

On the formulation and implementation of mixed mode I and mode II extrinsic cohesive zone models with contact and friction, with F. Bourrier & V. Acary. For submission to Computer Methods in Applied Mechanics and Engineering.

Cosserat Breakage Mechanics with porosity, with I. Stefanou, J. Sulem & I. Einav. For submission to the Journal of Mechanics and Physics of Solids.

Non-smooth control of earthquakes, with I. Stefanou, V. Acary & B. Brogliato.

Image-based analysis of the formation of shear bands in a Coutte-cell type apparatus using X-rays, with J. Baker, F. Guillard, I. Stefanou, J. Sulem & I. Einav.

**Prizes, Scholarships and other Academic Achievements**

2022 Marie Skłodowska-Curie Actions Postdoctoral Award.

2017 Early Career Researcher grant to attend the 12th Euro-conference on Rock Physics & Geomechanics.

2016 Postgraduate Research Support Scheme.

2015 Australian Postgraduate Award, University of Sydney Merit Award (for three and a half years each).

2014 D. G. Walkom Prize for First Class Honours in Civil Engineering, Dean's List of Excellence in Academic Performance.

2013 D. Campbell-Allen Prize in Civil Engineering, invitation to participate in the Summer Research Scholarship programme.

2012 University of Sydney Academic Merit Prize, Dean's List of Excellence in Academic Performance, invitation to participate in the Summer Research Scholarship programme.

2011 University of Sydney Academic Merit Prize, Dean's List of Excellence in Academic Performance, invitation to participate in the Summer Research Scholarship programme.

2010 Awarded Roads and Maritime Services Scholarship in Civil Engineering for length of Bachelor's Degree.

**Academic Service**

Reviewer for Acta Geotechnica, Computer Methods in Applied Mechanics and Engineering, Computational Mechanics, Computers and Geotechnics, Journal of Geophyiscal Research: Solid Earth, Powder Technology, Rock Mechanics and Rock Engineering, and Scientific Reports.

Organisational assistant for 6th International Conference on Coupled THMC Processes in Geosystems, Paris, France, 05/07/2017 – 07/07/2017.

**Other Academic Qualifications**

Qualification aux fonctions de Maître de Conférences in sections 36 and 60 of the Conseil National des Universités, 2022 qualification campaign.

**Other Academic Work**

2019 Assignment marking and substitute tutor for CIVL2410 Soil Mechanics.

2017 – 2018 Scientific English editing of a wide variety of scientific papers written by other ENPC researchers.

2016 Tutor for ENGG1801 Engineering Computing.

2015 Tutor for CIVL3411 Geotechnical Engineering.

**Non-Academic Employment**

English tutor, 2017 – 2018. Self-employed English tutor in France.

Kambala, 2015 – 2016. Debating coach for the Independent Schools Debating Association and Archdale Schools competitions.

The Arts Unit, 2011 – 2015. Debating adjudicator for public primary and high schools in the Northern Sydney region.

Maths and Physics Tutor, 2015. Self-employed private tutor for first year Maths and Physics subjects.

Roads and Maritime Services, 2011 – 12, 2012 – 13, 2013 – 14. Three separate stints over the summer break in association with my scholarship. I played a role in project management of a A$400 million public works (Northern Beaches Hospital Connectivity and Network Enhancement) in the Project Development unit (13 – 14), developer liaison on large projects such as Wynyard Walk and Moorebank Units Relocation (Holsworthy Barracks) in the Project Management unit (12 – 13), and material behaviour research in the Pavements unit (11 – 12).

Trombone Tutor, 2011 – 14. Self-employed.

Engineering Studies Tutor, 2011. Self-employed.

**Technical Skills**

Theoretical constitutive modelling.
Specialisation in modelling the localisation of deformation. Higher order continuum mechanics, in particular the Cosserat continuum, linear stability analysis of mechanical systems, cohesive zone modelling of crack propagation.

Programming.
Proficient in Python, Julia, MATLAB and Mathematica, competent in C++, some notions in Haskell, Fortran and Basic.

Software.
Proficient in FEniCS, Siconos, LaTeX and Microsoft Office suite, competent in GIMP, some notions in MOOSE.

Operating systems.
Proficient in Microsoft Windows, Ubuntu Linux.

**Citizenship**

Australian.

**Languages**

English (mother tongue), French (proficient).

**Contact Information**

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