

# dr.ir. Tom de Geus

## Curriculum Vitae

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*"It's not the answers you give, but the questions you ask" – Voltaire*

## Experience

- 2016 **Post-doctoral fellowship of the Netherlands Science Foundation (NWO).**  
"Group-think in friction": emergent statistical phenomena in tribology  
École Polytechnique Fédérale de Lausanne (EPFL), Switzerland
- 2016 **Post-doc: valorization project for M2i and TATA Steel Europe.**  
Development of open-source software GooseEYE  
Eindhoven University of Technology, The Netherlands

## Education

- 2012–2016 **PhD Mechanical Engineering (*cum laude*).**  
Eindhoven University of Technology, The Netherlands
- 2012–2016 **Graduate School Engineering Mechanics.**  
3TU – Joint Universities of Technology in The Netherlands
- 2009–2012 **Master Mechanical Engineering (*with great appreciation*).**  
Mechanics of materials, GPA 8.5  
Eindhoven University of Technology, The Netherlands
- 2011 **Internship (*excellent evaluation*).**  
School of Engineering and Applied Sciences  
Harvard University, Cambridge, Massachusetts, USA
- 2004–2009 **Bachelor Mechanical Engineering (*with great appreciation*).**  
Minor: entrepreneurship  
Eindhoven University of Technology, The Netherlands
- 1997–2004 **Pre-university secondary education.**  
Specialization: science and technology  
Lorentz Casimir Lyceum, The Netherlands

## PhD Thesis

- Title From damage to fracture, from micro to macro: a systematic study of ductile fracture in multi-phase microstructures
- Supervisors Promotor prof.dr.ir. Marc Geers, co-promotor dr.ir. Ron Peerlings
- Description This thesis examines the mechanics of multi-phase materials in a statistical manner. Using structured models and dedicated experiments, at the microstructural level, the most essential ingredients of the initiation and propagation of fracture are identified.
- Extra President of Hora Est - PhD association for mechanical and bio-mechanical engineering.  
Professionalization of cluster usage and set-up of a collaboration platform.  
Co-lecturer of "Finite element method" and "Experimental and numerical skills".  
Supervision of fourteen bachelor theses (or equivalent internships) and one master thesis.

## Awards

- 2015 Poster award, Best innovative research value, M2i annual research conference. Award: 250 euro.
- 2013 Poster award, M2i annual research conference. Award: 250 euro.
- 2008 Entrepreneur award, Best business case, Eindhoven University of Technology. Award: 1000 euro.

## Fellowships

- 2016 Rubicon fellowship of the Dutch science foundation (NWO) to do two years of research abroad (160000 euro)

## Publications

1. T.W.J. de Geus, J. Vondřejc, J. Zeman, R.H.J. Peerlings, M.G.D. Geers. Finite strain FFT-based non-linear solvers made simple. *Computer Methods in Applied Mechanics and Engineering*, (IPF 3.915), Accepted, 2017. *arXiv: 1603.08893*, *doi: 10.1016/j.cma.2016.12.032*
2. J. Zeman, T.W.J. de Geus, J. Vondřejc, R.H.J. Peerlings, M.G.D. Geers. A finite element perspective on non-linear FFT-based micromechanical simulations. *International Journal for Numerical Methods in Engineering* (IPF 2.1), Accepted, 2017. *arXiv: 1603.08893*
3. T.W.J. de Geus, R.H.J. Peerlings, M.G.D. Geers. Fracture in multi-phase materials: why some microstructures are more critical than others. *Engineering Fracture Mechanics* (IPF 2.012), 169:354-370, 2017. *doi: 10.1016/j.engfracmech.2016.08.009*
4. T.W.J. de Geus, F. Maresca, R.H.J. Peerlings, M.G.D. Geers. Microscopic plasticity and damage in multi-phase steels: on the competing role of crystallography and phase contrast. *Mechanics of Materials* (IPF 2.598), 101:147-159, 2016. *doi: 10.1016/j.mechmat.2016.07.014*, *arXiv: 1603.05847*
5. T.W.J. de Geus, J.E.P. van Duuren, R.H.J. Peerlings, M.G.D. Geers. Fracture initiation in multi-phase materials: a statistical characterization of microstructural damage sites. *Materials Science and Engineering-A* (IPF 2.959), 2016. *doi: 10.1016/j.msea.2016.06.082*
6. T.W.J. de Geus, R.H.J. Peerlings, M.G.D. Geers. Competing damage mechanisms in multi-phase metals: a systematic multi-scale approach. *International Journal of Solids and Structures* (IPF 2.483), 2016. *doi: 10.1016/j.ijsolstr.2016.03.029*
7. T.W.J. de Geus, M. Cottura, B. Appolaire, R.H.J. Peerlings, M.G.D. Geers. Fracture initiation in multi-phase materials: a systematic three-dimensional approach using a FFT solver. *Mechanics of Materials* (IPF 2.598), 2016. *doi: 10.1016/j.mechmat.2016.02.006*
8. T.W.J. de Geus, C. Du, J.P.M. Hoefnagels, R.H.J. Peerlings, M.G.D. Geers. Systematic and objective identification of the microstructure around damage directly from images. *Scripta Materilia* (IPF 3.323), 113:101-105, 2016. *doi: 10.1016/j.scriptamat.2015.10.007*
9. T.W.J. de Geus, R.H.J. Peerlings, M.G.D. Geers. Microstructural topology effects on the onset of ductile failure in multi-phase materials – a systematic computational approach. *International Journal of Solids and Structures* (IPF 2.483), 67-68:326-339, 2015. *doi: 10.1016/j.ijsolstr.2015.04.035*
10. T.W.J. de Geus, R.H.J. Peerlings, M.G.D. Geers. Microstructural modeling of ductile fracture initiation in multi-phase materials. *Engineering Fracture Mechanics* (IPF 2.012), 147:318-330, 2015. *doi: 10.1016/j.engfracmech.2015.04.010*
11. J. van Beeck, F. Maresca, T.W.J. de Geus, P.J.G. Schreurs, M.G.D. Geers. Predicting deformation-induced polymer-steel interface roughening and failure. *European Journal of Mechanics / A Solids* (IPF 1.996), 55:1-11, 2015. *doi: 10.1016/j.euromechsol.2015.08.002*
12. T.W.J. de Geus, R.H.J. Peerlings, C.B. Hirschberger. An analysis of the pile-up of infinite periodic walls of edge dislocations. *Mechanics Research Communications* (IPF 1.700), 54, 7-13, 2013. *doi: 10.1016/j.mechrescom.2013.08.010*

## Conference proceedings

1. T.W.J. de Geus, R.H.J. Peerlings, M.G.D. Geers. Systematic analysis of fracture in two-phase materials at all stages. *Proceedings of the 24th International Congress of Theoretical and Applied Mechanics*, 2016.
2. J.P.M. Hoefnagels, C. Du, T.W.J. de Geus, R.H.J. Peerlings, M.G.D. Geers. A Statistical / Computational / Experimental Approach to Study the Microstructural Morphology of Damage. Chapter 8 in *Fracture, Fatigue, Failure and Damage Evolution*, Volume 8: *Proceedings of the 2014 Annual Conference on Experimental and Applied Mechanics*; Eds.: A.M. Beese et al., 61–65, 2015. *doi: 10.1007/978-3-319-21611-9\_8*.
3. T.W.J. de Geus, R.H.J. Peerlings, M.G.D. Geers. Topology and Morphology Influences on the Onset of Ductile Failure in a Two-phase Microstructure. *Procedia Materials Science*, 2014. *doi: 10.1016/j.mspro.2014.06.099*
4. T.W.J. de Geus. Micro and meso analysis of two-dimensional dislocation pile-up. *Proceedings of the Second Student Research Conference*, 2011.
5. C.B. Hirschberger, T.W.J. de Geus, R.H.J. Peerlings, W.A.M. Brekelmans, M.G.D. Geers. Dislocation interactions in strain gradient crystal plasticity. *Proceedings of the 4th European Congress on Computational Mechanics*, 2010.
6. R.H.J. Peerlings, T.W.J. de Geus, M.G.D. Geers. Micro and meso analysis of two-dimensional dislocation pile-up. *Proceedings of the 5th International Conference Multiscale Materials Modeling*, 2010.
7. R.H.J. Peerlings, Y. Kasyanyuk, A. Roy, M.G.D. Geers, T.W.J. de Geus, C.B. Hirschberger. Homogenisation of dislocation interactions towards a mesoscopic plasticity framework. *Proceedings of the 1st International Conference on Material Modelling*, 2010.

## International expert

- J. Vondřejc, J. Zeman. Research grant by the German and Czech science foundations for 1 PhD student and 1 Post-doc. Contribution: 2 weeks per year.
- Reviewer for *Mechanics of Materials*, *Strain*, and *Computational Materials Science*.

## Invited presentations

1. Fifth International Conference on Computational Modeling of Fracture and Failure of Materials and Structures, CFRAC, 2017, Nantes, France, planned.
2. International Conference on Computational Plasticity, 2015, Barcelona, Spain.
3. European Solid Mechanics Conference, 2015, Madrid, Spain.

## Conference presentations

3. ICTAM, 2016, Montreal, Canada.
4. European Conference on Fracture, 2016, Catania, Italy.
5. ECCOMAS Young Investigators Conference. 2016, Crete, Greece.
6. ECCOMAS. 2016, Crete, Greece.
7. Annual conference Materials Innovation Institute. 2016, Sint-Michielsgestel, The Netherlands.
8. Euromech colloquium 570: impact of microstructure on plasticity. 2015, Houffalize, Belgium.
9. U.S. National Congress on Computational Mechanics, 2015, San Diego, United States.
10. Euromech colloquium 559: multi-scale computational methods, Eindhoven, The Netherlands.
11. European Mechanics of Materials Conference, 2014, Gothenburg, Sweden.
12. World Conference on Computational Mechanics, 2014, Barcelona, Spain.
13. European Conference on Fracture, 2014, Trondheim, Norway.
14. Annual Engineering Mechanics Symposium, 2013, Lunteren, The Netherlands.
15. Conference on Computational Plasticity, 2013, Barcelona, Spain.
16. International Conference on Fracture, 2013, Beijing, China.
17. Student Research Conference, 2012, Eindhoven, The Netherlands.

## Colloquia

1. MINES ParisTech, Centre for Material Forming (cemef), Sophia-Antipolis, France.
2. TATA Steel Europe, IJmuiden, The Netherlands.

## Supervised BSc/MSc graduation projects

1. Clàudia Ylla Arbós (internship, EPFL).  
*Modeling of inflatable structures using structural elements.*
2. Joris van Duuren (MSc, Eindhoven University of Technology).  
*Experimental characterization of microstructural damage and phase distribution in dual phase steel.*
3. Bram Dorussen (BSc, Eindhoven University of Technology).  
*Obtaining graded dual phase steel microstructures: an out-of-the-box approach.*
4. Jérôme Keulen (BSc, Eindhoven University of Technology).  
*Creating artificial microstructures with phase field.*
5. Guido Brekelmans (BSc, Eindhoven University of Technology).  
*Image segmentation: a phase field approach.*
6. Randy Smeenk (BSc, Eindhoven University of Technology).  
*Phase field modeling of dual-phase materials.*
7. Sjoerd Tilmans (BSc, Eindhoven University of Technology).  
*Relating microstructural morphology to the initiation of fracture: a Monte Carlo based approach.*
8. Jacco Hubregtse (BSc, Eindhoven University of Technology).  
*Identification of phases in noise-polluted microstructural images.*
9. Mathijs Brands (BSc, Eindhoven University of Technology).  
*Mimicking microstructures using a Monte Carlo based approach.*
10. Freek Ramp (BSc, Eindhoven University of Technology).  
*Efficient computation of multiple phase material statistics.*
11. Willem Mulder (BSc, Eindhoven University of Technology).  
*Phase recognition in dual-phase steel micrographs.*
12. Thomas Lapasset (internship, Eindhoven University of Technology).  
*Characterization of damage mechanisms in dual phase steel.*
13. Quentin Dronneau (internship, Eindhoven University of Technology).  
*Establishment of phase identification and damage software for microscopic images of dual phase steel.*
14. Jaime Ortún (internship, Eindhoven University of Technology).  
*A computational study of microstructural geometry influence in dual-phase steels.*
15. Nick Maassen (BSc, Eindhoven University of Technology).  
*Microstructural modelling of ductile failure in dual-phase steel: Increasing the computational efficiency.*
16. Pavlos Hatzidimitris (BSc, Eindhoven University of Technology).  
*Mesh dependency in idealized microstructural simulations of Dual Phase steel.*

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## Personal development

Taking charge of your PhD.  
Scientific integrity.  
Supervising master students.  
Supervising design based learning.  
The art of presenting science.  
Presenting skills.

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## Computer skills

Languages C++, C, Fortran, Python, Matlab, Bash, Latex  
Developed GooseFEM: a finite element program (in Python/C)  
GooseEYE: geometrical statistics for images (in Python/C)

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## Languages

Dutch Mother tongue  
English Proficient speaker  
French Intermediate speaker

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## Interests

Sports Field hockey, running  
Outdoor Skiing, hiking, traveling  
Indoor Reading, cooking

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## Pre-graduate experience

### Teaching

- 2012–2016 **Supervisor of bachelor and master graduation projects,**  
*Eindhoven University of Technology,*  
Has lead to the development of and insight in management and interpersonal skills.
- 2008–2016 **Lecturer bachelor programming project,**  
*Eindhoven University of Technology,*  
Has given me insight in why SMART goals are so important.
- 2009–2012 **Tutor exercise sessions bachelor course finite element method,**  
*Eindhoven University of Technology,*  
Taught me how to sub-divide matter for students to the grasp details and obtain an overview.
- 2009–2010 **Developer of a tensor toolbox for Matlab for education purposes,**  
*Eindhoven University of Technology,*  
Required me to carefully define an interface to enhance students' understanding.
- 2008–2009 **Tutor design based learning (bachelor),**  
*Eindhoven University of Technology,*  
Has provided me with understanding of group dynamics.
- 2004–2008 **Tutor high school students in physics and math,**  
*Lorentz Casimir Lyceum,*  
Taught me how to bridge the scale in level (focus on what is essential).

### Volunteer

- 2008–2009 **Buddy of autistic first year student,** *Eindhoven University of Technology.*  
2003–2007 **Keepers equipment commissioner,** *Field hockey, Eindhoven.*

### Miscellaneous

- 2003–2007 **Sales employee industrial equipment rental company,** *Boels rental.*  
2001–2004 **Hospitality employee in a soccer stadium,** *Maison van den Boer.*