

Nicolas Van Goethem

CMAFcIO

*Centro de Matemática, Aplicações Fundamentais
e Investigação Operacional*

Faculdade de Ciências

Departamento de Matemática

Campo Grande, Edifício C6,

1749-016 Lisboa, Portugal

✉ vangoeth@fc.ul.pt

☎ +351930416751

Belgian

Born: 12 March 1976 in Sorengo (CH)

Married, 2 children

1 Scholarly indicators

Database coordinates

Researcher ID (WoS): A-7674-2013

ORCID ID: 0000-0002-5356-8383

SCOPUS ID: 36509173100

MR Author ID number: 749820

(van goethem, n^{*})

zbMATH: van-goethem.nicolas

H-index

Google scholar=11

Researchgate=11

ISI (WoS)=8

Scopus=8

Citations

Google scholar=440

Researchgate=359

ISI (WoS)=215

Scopus=217

2 Research interests

Mathematical modelling in material science: theory, numerics & applications.

Physical and mathematical science of solids:

Continuum mechanics & thermodynamics of defects in solids (damage, fracture & dislocations);

Finite elasticity & linearized elasto-plasticity;

Axiomatic approach to thermodynamics.

Variational methods in material science:

Γ -convergence;

Shape and topological optimization methods: theory and numerics.

Partial differential equations (elliptic & parabolic) and functional analysis;

Geometric measure theory (theory of currents for dislocation modelling);

Differential geometry (non-Riemannian geometry of crystals with defects).

3 Curriculum data

3.1 Education

Doctorat en Sciences Appliquées, Ecole Polytechnique de Louvain, Université catholique de Louvain (UCL), Louvain-la-Neuve, Belgium

Graduate studies in Applied Mathematics: Université catholique de Louvain (UCL), Ecole Polytechnique de Louvain, Louvain-la-Neuve, Belgium

Undergraduate studies: European School of Varese (Italy) and Brussels (Belgium).

3.2 *Qualifying Examinations*

14/11/2014: Italian Associate Professor Qualification in Mathematical Analysis, Probability and Statistics ("abilitazione alle funzioni di professore di seconda fascia in analisi matematica, probabilità e statistica matematica" (qualified with unanimity.)

2007: French qualification for "Maître de Conférence" position in Applied Mathematics (section 26).

3.3 *Employment history*

July 2014 - June 2019: iFCT faculty researcher at the Mathematics Department, Faculty of Science, Lisbon, Portugal

Dec. 2012-June 2014: Contract researcher at the Functional Analysis Sector, SISSA, Trieste, Italy

ERC project: "Quasistatic and Dynamic Evolution Problems in Plasticity and Fracture"
(PI: G. Dal Maso)

April 2008-November 2012: Ciência faculty researcher at CMAF, Lisbon, Portugal

Ciência 2007 contract

Jan. 2007- Feb. 2008: Post-doctoral training at the Ecole Polytechnique, Palaiseau, France

ER-Marie Curie post-doctoral fellow

Work with G. Allaire on Optimization problems (MULTIMAT Research Training Network)

Sept. 2000 - Dec. 2006: Doctoral research and teaching assistant at UCL, Belgium

PhD fellowship & contract of research assistant. Supervisor: F. Dupret

Sept. 2003 - Dec. 2003:

ESR-Marie-Curie fellowship at University College of London, UK

Work with D. Preiss on Real analysis problems

Sept. 1999 - Aug. 2000: Internship at the University of Pisa, Italy,

Grant from Belgian CGRI

Work with G. Buttazzo on Shape optimization problems

3.4 *Competitions, Prizes & Grants*

2014: Selected for FCT exploratory research project (MATH2DISLOC-50K euros grant).

2013: Selected for Investigador FCT 2013 call.

2012: Selected for ERC researcher fellowship call at SISSA, Trieste (IT).

2008: Selected for FCT Ciência 2007 call.

2006: Selected for Marie Curie ER fellowship call.

2003: Selected for Marie Curie ESR fellowship call.

4 Scientific projects and funding

4.1 *Projects and external funding*

- As PI:

MATH2DISLOC FCT research project (2014-2019): "Mathematical theory of dislocations: geometry, analysis, and modelling".

4.2 Group coordination

2017-Currently: "Mathematical modelling in material science: fracture, dislocations and elastoplasticity".

Description: This research unit within CMAFcIO carries out research in the mathematical modelling and/or analysis of phenomena arising in material science, in particular about solids with defects and singularities such as cracks and dislocations. Variational as well as non-variational techniques are used and developed. Theoretical as well as numerical results are sought. New models, new methods and new algorithms are proposed.

Members:

Riccardo Scala (CFAMcIO post-doc, 2017-2018) works on "Dislocation lines in single crystals: mathematical formalism and modelling".

Marco Caroccia (post-doc, 2017-2018) works on "Damage-to fracture models: theory and applications".

Pedro Campos (Gulbenkian novos talentos, 2017-): works on "A fundamental approach to Entropy principles".

4.3 Conference & symposium organization

- Keynote lecture & minisymposium at Conference *Dynamics, Equations and Applications*, AGH University of Science and Technology (Kraków, Poland), September 16-20, 2019 (<https://www.dea.agh.edu.pl/>).
- Topics in nonlinear analysis: Calculus of variations and PDEs- *Autumn 2018 Workshop in Lisbon*. Lisbon, October 10-12, 2018 (<https://sites.google.com/view/cvdpdelisboa/home>).
- First CIM-WIAS workshop: *Topics in Applied Analysis and Optimisation (Stochastic, Partial Differential Equations and Numerical Analysis)*. Lisbon, December 6-8, 2017 (<http://cmafcio.ciencias.ulisboa.pt/taao2017>).

5 Written scientific production

5.1 Publications in international peer-reviewed journals (37)

3. M. Caroccia and **N. Van Goethem**, Damage-driven fracture with low-order potentials: asymptotic behavior and applications, to appear on ESAIM:M2AN, 2019. <https://hal.archives-ouvertes.fr/hal-01963478>. (ISI IF=2.03, Scimago & WoS Q1).
4. R. Scala, **N. Van Goethem**, Analytic and geometric properties of dislocation singularities, to appear on Proc. R. Soc. Edinburgh: Section A Math., 2019, DOI:10.1017/S0308210518000574. (ISI IF=1.16, Scimago & WoS Q1).
5. R. Scala, **N. Van Goethem**, A variational approach to single crystals with dislocations, SIAM J. Math. Anal., 51 (1), 489–531, 2019 (ISI IF=1.65, Scimago & WoS Q1).
6. R. Scala, **N. Van Goethem**, Variational evolution of dislocations in single crystals, J. Nonlinear Sci., 29(1), 319–344, 2019. (ISI IF=1.90, Scimago & WoS Q1).

2018

7. M. Xavier, **N. Van Goethem**, A. Novotny, A simplified model of fracking based on the topological derivative concept., Int. J. Sol. Struct., 139-140, 211–223, 2018. (ISI IF=2.58, Scimago & WoS Q1).

2017

8. **N. Van Goethem**, Front migration for the dislocation strain in single crystals, Commun. Math. Sci., 15(7), 1843-1866, 2017. (ISI IF=1.43, Scimago & WoS Q1).

9. M. Xavier, **N. Van Goethem**, A. Novotny, J.-M. Faria, E. Fancello, Topological Derivative-Based Fracture Modelling in Brittle Materials: A Phenomenological Approach, *Eng. Frac. Mech.*, 179 (15), 13–7, 2017. (ISI IF=2.15, Scimago & WoS Q1).
 10. **N. Van Goethem**, Incompatibility-governed singularities in linear elasticity with dislocations, *Math. Mech. Solids*, 22(8), 1688-1695, 2017. (ISI IF=2.95, Scimago & WoS Q1).
 11. S. Amstutz and **N. Van Goethem**, Incompatibility-governed elasto-plasticity for continua with dislocations, *Proc. R. Soc. Lond., Ser. A*, 473: 20160734, 2017. (ISI IF=2.15, Scimago & WoS Q1).
- 2016**
12. **N. Van Goethem**, The Frank tensor as a boundary condition in intrinsic linearized elasticity, *J. Geom. Mech.*, 8(4), 391–411, 2016. (ISI IF=0.86, Scimago Q2 & WoS Q3).
 13. S. Amstutz and **N. Van Goethem**, Analysis of the incompatibility operator and application in intrinsic elasticity with dislocations, *SIAM J. Math. Analysis*, 48 (1), 320-348, 2016. (ISI IF=1.65, Scimago & WoS Q1).
 14. R. Scala, **N. Van Goethem**, Constraint reaction and the Peach-Koehler force for dislocation networks, *Math. Mech. Complex. Syst.*, 4 (2), 105–138, 2016**.
 15. **N. Van Goethem**, Dislocation-induced linear-elastic strain dynamics by Cahn-Hilliard-type equations, *Math. Mech. Complex. Syst.*, 4 (2), 169–195, 2016**.
 16. **N. Van Goethem**, Direct expression of incompatibility in curvilinear systems, *The ANZIAM Journal*, 58, 33-50, 2016. (ISI IF=0.9, Scimago & WoS Q3).
 17. R. Scala, **N. Van Goethem**, Currents and dislocations and the continuum scale, *Meth. Appl. Analysis*, 23 (1), 1–34, 2016.**
- 2015**
18. G. Maggiani, R. Scala, **N. Van Goethem**, A compatible-incompatible decomposition of symmetric tensors in L^p with application to elasticity, *Math. Meth. Appl. Sc.*, 38 (18), 5217-5230, 2015. (ISI IF=1.02, Scimago & WoS Q1).
 19. **N. Van Goethem**, Cauchy elasticity with dislocations in the small strain assumption, *Appl. Math. Lett.*, 96, 94-99, 2015. (ISI IF=2.46, Scimago & WoS Q1).
- 2014**
20. S. Amstutz, A. Novotny, **N. Van Goethem**, Minimal partitions and image classification with a gradient-free perimeter approximation, *Inv. Pbl. Imag.*, 8 (2), 361-387, 2014 . (ISI IF=1.46, Scimago Q2 & WoS Q1).
 21. S. Amstutz, A. Novotny, **N. Van Goethem**, Topological sensitivity analysis for elliptic differential operators of order $2m$, *J. Diff. Eqs.*, 256 (4), 1735-1770, 2014. (ISI IF=1.78, Scimago & WoS Q1).
 22. **N. Van Goethem**, Thermodynamical forces in single crystals with dislocations, *Z. ang. Math. Phys.*, 65 (3), 549-586, 2014. (ISI IF=1.71, Scimago & WoS Q1).
 23. **N. Van Goethem**, Fields of bounded deformation for mesoscopic dislocations, *Math. Mech. Solids*, 19 (5), 579-600, 2014. (ISI IF=2.76, Scimago & WoS Q1).
- 2013**
24. P. Areias, D. Dias-da-Costa, E. B. Pires, **N. Van Goethem**, Asymmetric quadrilateral shell elements for finite strains, *Comp. Mech.*, 52 (1), 81-97, 2013. (ISI IF=2.86, Scimago & WoS Q1).
 25. H.G. Silva, P. Areias, **N. Van Goethem**, M. Bezzeghoud, Damage-based fracture with electromagnetic coupling, *Comp. Mech.*, 51 (3), 629-640, 2013. (ISI IF=2.86, Scimago & WoS Q1).

26. P. Areias and **N. Van Goethem**, A finite-strain temperature-dependent ductile fracture model with configurational forces, *Int. J. Fracture*, 178 (1-2), 215-232, 2013. (ISI IF=2.17, Scimago Q1 & WoS Q2).

2012

27. **N. Van Goethem**, Kröner's formula for dislocation loops revisited, *Mech. Res. Commun.*, 46, 62-70, 2012. (ISI IF=2.67, Scimago Q2 & WoS Q3).
28. **N. Van Goethem** and F. Dupret, A distributional approach to the geometry of 2D dislocations at the continuum scale, *Ann. Univ. Ferrara*, 58 (2), 407-434, 2012.
29. S. Amstutz and **N. Van Goethem**, Topology optimization methods with gradient-free perimeter approximation, *Interfaces and Free Boundaries*, 14 (3), 401-430, 2012. (ISI IF=0.64, WoS Q3).
30. **N. Van Goethem** and F. Dupret, A distributional approach to 2D Volterra dislocations at the continuum scale, *Europ. Jnl. Applied Math.*, 23 (3), 417-439, 2012. (ISI IF=1.0 WoS Q2).
31. **N. Van Goethem**, A multiscale model for dislocations: from mesoscopic elasticity to macroscopic plasticity, *Journal of Applied Mathematics and Mechanics (ZAMM)*, 92 (7), 514-535, 2012. (ISI IF=1.3, Scimago & WoS Q2).

2011

32. **N. Van Goethem**, Shape optimization for a time-dependent 4th-order equation in a dislocation model, *C. R. Acad. Sci. Paris. Ser. I* 340, 349, 923-927, 2011. (ISI IF=0.52, Scimago Q2 & WoS Q3).
33. G. Allaire, F. Jouve, **N. Van Goethem**, Damage and crack evolution by shape optimization methods, *J. Comput. Phys.* 230 (12), 5010-5044, 2011. (ISI IF=2.75, Scimago & WoS Q3 Q1).
34. P. Areias, **N. Van Goethem** and E. B. Pires, A damage model for ductile crack initiation and propagation, *Comp. Mech.* 47 (6), 641-656, 2011. (ISI IF=2.86, Scimago & WoS Q1).
35. **N. Van Goethem**, Strain incompatibility in single crystals: Kröner's formula revisited, *J. Elast.*, 103 (1), 95-111, 2011. (ISI IF=1.65, Scimago Q1 & WoS Q2).

2010

36. **N. Van Goethem**, The non-Riemannian dislocated crystal: a tribute to Ekkehart Kröner, *J. Geom. Mech.*, 2 (3), 303-320, 2010. (ISI IF=0.86, Scimago Q2 & WoS Q3).
37. **N. Van Goethem**, A.A. Novotny, Crack Nucleation Sensitivity Analysis, *Math. Meth. Appl. Sc.*, 33 (16), 1978-1994, 2010. (ISI IF=1.02, Scimago & WoS Q1).

2008

38. **N. Van Goethem**, A. de Potter, N. Van den Bogaert, F. Dupret, Dynamic Prediction of Point Defects in Czochralski Silicon Growth. An Attempt to Reconcile Experimental Defect Diffusion Coefficients with the V/G criterion, *J. Phys. Chem. Solids*, 69, 320-324, 2008. (ISI IF=2.06, Q2).

2004

39. **N. Van Goethem**, Variational problems on classes of convex domains, *Commun. Appl. Analysis*, 8 (3), 353-371, 2004

★ See Scimago detailed analysis in the attached document.

★★ New journal with high-level editorial board.

5.2 *International conference proceedings (2)*

40. S. Amstutz and **N. Van Goethem**, The incompatibility operator: from Riemann's intrinsic view of geometry to a new model of elasto-plasticity, CIM Series in Mathematical Sci., J. F. Rodrigues and M. Hintermüller eds., 2019 (to appear). (Hal preprint: hal- 01789190).
41. G. Allaire, F. Jouve, **N. Van Goethem**, A level set method for the numerical simulation of damage evolution, in PROCEEDINGS OF ICIAM 2007 ZÜRICH, R. Jeltsch and G. Wanner eds., EMS, Zürich, 2009

6 Pedagogical activity and training

6.1 *Lecturing and teaching*

Mathematics Department, University of Lisbon (in Portuguese)

- Lecturing
 - Mathematical methods in Physics (Master, 2016-, 6h weekly, ECTS: 9, Portuguese and English.)
 - Rational mechanics (Undergraduate, 2015-, 5h weekly, ECTS: 6, Portuguese.)
- Teaching
 - Computational methods in Geology (Undergraduate, 2009-2012, 3h weekly, Portuguese.)

7 Miscellaneous

Musical composition and organization of musical composition workshops. Tennis & hiking.

Last updated: March 26, 2019