
Marc De Graef: Curriculum Vitae

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Place and date of birth Antwerp (Belgium), April 7th 1961

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Citizenship USA/Belgium (dual citizenship)

University studies Physics (1979-1983)
“Experimental Solid State Physics : Electron Microscopy”
at the University of Antwerp (RUCA-UIA)

“Licentiaatsthesis” (\approx Masters Thesis) :
High Resolution Electron Microscopy :
– *Theoretical Aspects*
– *Study of $xMnS - yGa_2S_3$*
Thesis advisor : Prof. Dr. J. Van Landuyt

Ph. D. Thesis (defended 5/22/89)
*Contribution to the study of phase stability before and after
martensitic transformation in β -Cu-Zn-Al alloys.*

Minor thesis : *Changes in the normal electro-encephalographic
patterns during the different stages of a parabolic flight can
be identified by means of Fourier Transform techniques.*
Thesis advisors : Prof. Dr. L. Delaey, Prof. Dr. G. King

Professional History

- 9/1/83–2/28/84 : Research Assistant at the Laboratory for Solid State Chemistry and Heterogeneous Catalysis of the Rijksuniversiteit at Leiden (The Netherlands); electron microscopy research on sulfides and oxides.
- 3/1/84–8/31/89 : full time scientist at the Department of Metallurgy and Materials Engineering of the Catholic University of Leuven (Belgium); graduate studies.
- 9/1/89–2/28/93 : post-doctoral research stay as Assistant Research Engineer (EMP-14) at the Materials Department of the University of California at Santa Barbara; Temporary Lecturer for a graduate course on Crystallography and Diffraction.
- 10/1/90–10/1/92 : “Bevoegdverklaard Navorsers” (Research Associate), a tenured position at the Belgian National Fund for Research (NFWO) and Associate Professor at the Catholic University of Leuven (Belgium).
- 3/1/93–6/30/98 : Assistant Professor in the Department of Materials Science and Engineering, Carnegie Mellon University, Pittsburgh (tenure track)
- 4/1/96–present : Research Associate with the Carnegie Museum of Natural History (Pittsburgh, PA)
- 7/1/98–6/30/02 : Associate Professor in the Department of Materials Science and Engineering, Carnegie Mellon University, Pittsburgh (tenure track)
- 9/1/98–present: director of the J. Earle and Mary Roberts Materials Characterization Laboratory
- 1/1/02–6/30/02: Visiting Professor (sabbatical) at the University of Antwerp (Belgium)
- 7/1/02–present : Full Professor in the Department of Materials Science and Engineering, Carnegie Mellon University, Pittsburgh
- 1/1/12–12/31/12: Visiting Professor (sabbatical) at the Ohio State University, Columbus OH.

Awards

- “Grant” of the Belgian Society for Electron Microscopy for attending the ICOMAT-86 (Nara) and ICEM-86 (Kyoto) conferences in Japan.
- “Kazato Research Award” for contributions at the XIth ICEM at Kyoto (Japan, 1986).
- Invitation from the Japanese Government for a research stay of 3 months at the National Research Institute for Metals (Tokyo), with Dr. S. Kajiwara.
- Second prize in the Poster Competition at the 53rd Meeting of the Microscopy Society of America (Kansas City, 1995).
- George Tallman Ladd Award, College of Engineering, Carnegie Mellon University (1996)
- R.E. Peterson Award of the Society for Experimental Mechanics for the paper “A Simple Method for Measuring Surface Strains around Cracks,” Experimental Mechanics Vol. 36, 1996. (1998)
- Philbrook Teaching Award, Department of Materials Science and Engineering, CMU (2005).
- Fellow of the Microscopy Society of America (2009).
- Educator Award, The Minerals, Metals and Materials Society (2012)

Publication History (reverse chronological)

Books

- [3] M. De Graef and M.E. McHenry. *Structure of Materials: An Introduction to Crystallography, Diffraction, and Symmetry*. 2nd. Cambridge University Press, 2012.
- [2] M. De Graef and M.E. McHenry. *Structure of Materials: An Introduction to Crystallography, Diffraction, and Symmetry*. Cambridge University Press, 2007.
- [1] M. De Graef. *Introduction to Conventional Transmission Electron Microscopy*. Cambridge University Press, 2003.

Edited Books

- [1] M. De Graef and Y. Zhu, eds. *Magnetic Microscopy and its Applications to Magnetic Materials*. Vol. 36. Academic Press, 2000.

Book Chapters

- [5] C. Phatak and M. De Graef. “Imaging of domains and vortices in multi-functional materials” in: *Mesoscopic Phenomena in Multifunctional Materials*. Ed. by A. Saxena and A. Planes. Springer Verlag, 2014, pp. 137–158.
- [4] M. De Graef. “Transmission Electron Microscopy” in: *Handbook of Nanoscopy*. Ed. by G. Van Tendeloo, D. Van Dyck, and S. Pennycook. Vol. 1. Wiley-VCH, 2012, pp. 1–30.
- [3] A.K. Petford-Long and M. De Graef. “Lorentz Microscopy” in: *Characterization of Materials*. Ed. by L. Kaufmann. Wiley-VCH, 2012, pp. 1787–1801.
- [2] S.P. Venkateswaran and M. De Graef. “Imaging Techniques in Magnetoelastic Materials” in: *Interplay of Magnetism and Structure in Functional Materials*. Ed. by A. Planes, Mañosa Ll., and A. Saxena. Springer-Verlag, 2005.
- [1] M. De Graef. “Lorentz Microscopy: Theoretical Basis and Image Simulations” in: *Magnetic Microscopy and its Applications to Magnetic Materials*. Ed. by M. De Graef and Y. Zhu. Vol. 36. Experimental Methods in the Physical Sciences. Academic Press, 2000. Chap. 2.

Publications

- [233] A. Akhtari-Zavareh, S. Hua, M. De Graef, and K. Kavanagh. “Modeling of the magnetic phase shift of nanowires”. *Ultramicroscopy* (2015 (in preparation)).
- [232] M.L. Bowers, Y. Gao, L. Yang, D.J. Gaydos, M. De Graef, R.D. Noebe, Y. Wang, and M.J. Mills. “Austenite grain refinement during load-biased thermal cycling of a Ni_{49.9}Ti_{50.1} shape memory alloy”. *Acta Materialia* 91 (2015), pp. 318–329.
- [231] M.L. Bowers, M.J. Mills, and M. De Graef. “Simulated Kossel patterns as a tool for STEM diffraction contrast zone axis selection”. *Ultramicroscopy* (2015 (in preparation)).
- [230] P.G. Callahan, M.P. Echlin, M.A. Groeber, T.M. Pollock, and M. De Graef. “An evaluation of 3D texture visualization approaches”. *Acta Materialia* (2015 (in preparation)).
- [229] P.G. Callahan, M.P. Echlin, T.M. Pollock, and M. De Graef. “Measuring topography from EBSD patterns in Nickel”. *Microscopy and Microanalysis* (2015 (in preparation)).
- [228] P.G. Callahan, M. Groeber, L. Nguyen, and M. De Graef. “Towards a quantitative comparison between experimental and synthetic grain structures”. *Acta Materialia* (2015 (in preparation)).
- [227] M. Chapman, P.G. Callahan, and M. De Graef. “Determination of sample surface topography using electron back-scatter diffraction patterns”. *Scripta Mater.* (2015 (in preparation)).
- [226] Y.H. Chen, Park S.U., D. Wei, G. Newstadt, M. Jackson, J.P. Simmons, M. De Graef, and A.O. Hero. “A dictionary approach to EBSD indexing”. *Microsc. MicroAnal.* (2015 (in press)).
- [225] Y.H. Chen, D. Wei, G. Newstadt, M. De Graef, J.P. Simmons, and A.O. Hero. “Parameter Estimation in Spherical Symmetry Groups”. *IEEE Sign. Proc. Lett.* 22 (2015), pp. 1152–1155.
- [224] J.W. Gibbs, K.A. Mohan, E.B. Gulsoy, A.J. Shahani, X. Xiao, C.A. Bouman, M. De Graef, and P.W. Voorhees. “The three-dimensional morphology of growing dendrites”. *Scientific Reports* (2015 (under review)).
- [223] S. Kalidindi and M. De Graef. “Materials Data Science: Current Status and Future Outlook”. *Annual Review of Materials Research* (2015 (in press)).
- [222] A. Kumar, V. Sundararaghavan, L. Nguyen, and M. De Graef. “MRF texture synthesis approach for generation of metallic microstructures”. *Comp. Mat. Sci.* (2015 (under review)).

- [221] K.A. Mohan, S. Venkatakrisnan, J.W. Gibbs, E.B. Gulsoy, X. Xiao, M. De Graef, P.W. Voorhees, and C.A. Bouman. “TIMBIR: a method for time-space reconstruction from interlaced views”. *IEEE* (2015 (in press)).
- [220] K.A. Mohan, S.V. Venkatakrisnan, J.W. Gibbs, E.B. Gulsoy, X. Xiao, M. De Graef, P.W. Voorhees, and C.A. Bouman. “4D model-based iterative reconstruction from interlaced views”. *IEEE International Conference on Acoustics Speech and Signal Processing (ICASSP)*. 2015 (in press).
- [219] L. Nguyen, R. Shi, Y. Wang, and M. De Graef. “Quantification of rafting of γ' precipitates in Ni-based superalloys”. *Acta Materialia* (2015 (in preparation)).
- [218] L. Nguyen, D. Wang, Y. Wang, and M. De Graef. “Quantifying the strain glass transition in ferroelastic materials”. *Acta Materialia* (2015 (in press)).
- [217] C. Phatak, A.K. Petford-Long, and M. De Graef. “Breakdown of magnetic domains in multiferroics: from bubbles to confined skyrmions”. ? (2015 (in preparation)).
- [216] D.J. Rowenhorst, A.D. Rollett, G.S. Roher, M.A. Groeber, M.A. Jackson, P.J. Konijnenberg, and M. De Graef. “Tutorial: consistent representations of and conversions between 3D rotations”. *Modeling and Simulations in Materials Science and Engineering* (2015 (under review)).
- [215] S. Subedi, S. Singh, A.D. Rollett, and M. De Graef. “A dictionary approach to automated indexing of EBSD patterns in finely twinned microstructures”. *Acta Materialia* (2015 (in preparation)).
- [214] M. Syha, W. Rheinheimer, L. Nguyen, B. Loedermann, W. Augustin, A. Trenkle, W. Ludwig, D. Weygand, M. De Graef, M.J. Hoffmann, and P. Gumbsch. “Non-destructive evaluation of 3D microstructure evolution in strontium titanate” (2015 (under review)).
- [213] S.V. Venkatakrisnan, L.F. Drummy, M. Jackson, C.A. Bouman, J.P. Simmons, and M. De Graef. “A phantom-based forward modeling approach in support of model-based iterative reconstructions for HAADF-STEM tomography”. *Ultramicroscopy* (2015 (under review)).
- [212] J. Waggoner, Y. Zhou, J.P. Simmons, M. De Graef, and S. Wang. “Topology-preserving multi-label segmentation by propagating constrained ring structures and its applications to grain image segmentation”. *IEEE Winter Conf. Appl. Computer Vision*. 2015, pp. 1084–1091.
- [211] A. Wang and M. De Graef. “Modeling dynamical electron scattering with Bethe potentials and the scattering matrix”. *Ultramicroscopy* (2015 (in preparation)).
- [210] A. Wang, A. Leff, S. Singh, M. Taheri, and M. De Graef. “A dictionary-based indexing method for precession electron diffraction patterns”. *Microscopy and Microanalysis* (2015 (in preparation)).

- [209] S.I. Wright, M.M. Nowell, S.P. Lindeman, P.P. Camus, M. De Graef, and M.A. Jackson. “Introduction and comparison of new EBSD post-processing methodologies”. *Ultramicroscopy* (2015 (under review)).
- [208] M. Yan, M. De Graef, Y.N. Picard, and P.A. Salvador. “Electron channeling contrast imaging (ECCI) of anti-phase boundaries in coherently strained $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ thin films on (110)-oriented SrTiO_3 ”. *Appl. Phys. Lett.* (2015 (under review)).
- [207] C. Zhou, R. LeSar, and M. De Graef. “Combining Discrete Dislocation Dynamics with Electron Microscopy Image Simulations”. *Ultramicroscopy* (2015 (in preparation)).
- [206] M.L. Bowers, X. Chen, M. De Graef, P.M. Anderson, and M.J. Mills. “Characterization and modeling of defects generated in pseudoelastically deformed NiTi microcrystals”. *Scripta Materialia* 78-79 (2014), pp. 69–72.
- [205] M.L. Bowers, P.J. Phillips, J. Kwon, M.C. Brades, M.J. Mills, and M. De Graef. “Zone axis STEM defect imaging based on electron Kossel patterns”. *Microscopy and MicroAnalysis* 20 (suppl 3) (2014), pp. 114–115.
- [204] S.D. Carnevale, J.I. Deitz, J.A. Carlin, Y.N. Picard, M. De Graef, S.A. Ringel, and T.J. Grassman. “Applications of electron channeling contrast imaging for the rapid characterization of extended defects in III-V/Si heterostructures”. *IEEE J. Photovoltaics* PP:99 (2014), pp. 1–7.
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- [202] S.D. Carnevale, J.I. Deitz, T.J. Grassman, J.A. Carlin, Y.N. Picard, M. De Graef, and S.A. Ringel. “Rapid Misfit Dislocation Characterization in Heteroepitaxial III-V/Si Thin Films by Electron Channeling Contrast Imaging”. *Appl. Phys. Lett.* 104 (2014), p. 232111.
- [201] M. De Graef. “Towards a uniform model for lattice defect image simulations”. *Microscopy and MicroAnalysis* 20 (suppl 3) (2014), pp. 1022–1023.
- [200] J. Deitz, S. Carnevale, M. De Graef, Y.N. Picard, S.A. Ringel, T. Grassman, and D.W. McComb. “Using electron channeling contrast imaging for misfit dislocation characterization in heteroepitaxial III-V/Si thin films”. *Microscopy and MicroAnalysis* 20 (suppl 3) (2014), pp. 552–553.
- [199] E. Humphrey, C. Phatak, A.K. Petford-Long, and M. De Graef. “Separation of electrostatic and magnetic phase shifts using a modified transport-of-intensity equation”. *Ultramicroscopy* 139 (2014), pp. 5–12.

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- [196] C. Phatak, A.K. Petford-Long, M. Beleggia, and M. De Graef. “Theoretical study of ferroelectric nanoparticles using phase reconstructed electron microscopy”. *Phys. Rev. B* 89 (2014), p. 214112.
- [195] Y.N. Picard, M. Liu, J. Lammatao, R. Kamaladasa, and M. De Graef. “Theory of dynamical electron channeling contrast images of near-surface crystal defects”. *Ultramicroscopy* 146 (2014), pp. 71–78.
- [194] D. Roşca, A. Morawiec, and M. De Graef. “A new method of constructing a grid in the space of 3D rotations and its applications to texture analysis”. *Modeling and Simulations in Materials Science and Engineering* 22 (2014), p. 075013.
- [193] T.L. Smith, M.L. Bowers, M. De Graef, and M.J. Mills. “STEM-based characterization of dislocations and stacking faults in structural materials”. *Microscopy and MicroAnalysis* 20 (suppl 3) (2014), pp. 1032–1033.
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- [191] S.V. Venkatakrisnan, M.-S. Hsiao, N. Garvin, M.A. Jackson, M. De Graef, J.P. Simmons, C.A. Bouman, and L.F. Drummy. “Model-based iterative reconstruction for low-dose electron tomography”. *Microscopy and MicroAnalysis* 20 (suppl 3) (2014), pp. 802–803.
- [190] A. Wang and M. De Graef. “Using Bethe potentials in the scattering matrix for defect image simulations”. *Microscopy and MicroAnalysis* 20 (suppl 3) (2014), pp. 1030–1031.
- [189] M. Yan, M. De Graef, Y.N. Picard, and P.A. Salvador. “Defect analysis in $\text{La}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ epitaxial thin films by electron channeling contrast imaging (ECCI)”. *Microscopy and MicroAnalysis* 20 (suppl 3) (2014), pp. 1036–1037.
- [188] F. Yang, F. Scheltens, D. McComb, D.B. Williams, and M. De Graef. “Absorption corrections for a four-quadrant SuperX EDS detector”. *Microscopy and MicroAnalysis* 20 (suppl 3) (2014), pp. 100–101.
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- [185] E. Humphrey and M. De Graef. “On the computation of the magnetic phase shift for magnetic nano-particles of arbitrary shape using a spherical projection model”. *Ultramicroscopy* 129 (2013), pp. 36–41.
- [184] D. Roşca and M. De Graef. “Area-preserving projections from hexagonal and triangular domains to the sphere and applications to electron back-scatter diffraction pattern simulations”. *Modeling and Simulations in Materials Science and Engineering* 21 (2013), p. 055021.
- [183] H.J. Ryu, D.B. Fortner, S. Lee, R. Ferebee, M. De Graef, K. Misichrionis, A. Averopoulos, and M.R. Bockstaller. “Role of grain boundary defects during grain coarsening of lamellar block copolymers”. *Macromolecules* 46 (2013), pp. 204–215.
- [182] S.V. Venkatakrishnan, L.F. Drummy, M. Jackson, M. De Graef, J.P. Simmons, and C.A. Bouman. “A model based iterative reconstruction algorithm for high angle annular dark field scanning transmission electron microscopy (HAADF-STEM) tomography”. *IEEE Trans. Im. Proc.* 22 (2013), pp. 4532–4544.
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- [178] A. Budruk and M. De Graef. “TEM investigation of dislocations in an aged Ni-Mn-Ga alloy”. *Microscopy and MicroAnalysis* 18(S2) (2012), pp. 756–767.
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- [176] M. De Graef. “Electron channeling contrast image (ECCI) simulations”. *Microscopy and MicroAnalysis* 18(S2) (2012), pp. 682–683.
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- [164] C. Phatak, A.K. Petford-Long, M. Tanase, O. Heinonen, M. Pan, and M. De Graef. “Nanoscale structure of the magnetic induction at monopole defects in artificial spin-ice lattices”. *Phys. Rev. B* 83 (2011), p. 174431.
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