

# MATTEO SEITA, PhD.

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University of Cambridge  
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## Education

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- Ph.D., Materials Science** Nov 2007–Mar 2012  
ETH Zurich (CH)  
Thesis: Full microstructure control through ion-induced grain growth, texturing and constrained deformation in thin metal films  
Advisor: Ralph Spolenak, [ralph.spolenak@mat.ethz.ch](mailto:ralph.spolenak@mat.ethz.ch)
- M.Sc., Micro and Nanotechnologies for Integrated Systems (110/110)** Sep 2005–Sep 2007  
Politecnico di Torino (IT); INPG (FR); EPFL (CH)  
Thesis: Low temperature growth of crystalline, vertically aligned carbon nanotubes on conductive substrates for interconnect applications  
Advisor: Carl V. Thompson, [cthomp@mit.edu](mailto:cthomp@mit.edu)
- B.Sc., Electronic Engineering (98/110)** Sep 2001–Sep 2005  
Politecnico di Torino (IT)

## Professional Appointments

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- Granta Design Assistant Professor** Sep 2022–present  
University of Cambridge (UK)  
Department of Engineering
- Nanyang Assistant Professor/NRF Fellow** Jan 2018–Aug 2022  
Nanyang Technological University (SGP)  
School of Mechanical & Aerospace Engineering  
School of Materials Science & Engineering  
Asian School of the Environment
- Assistant Professor** Oct 2016–Jan 2018  
Nanyang Technological University (SGP)  
School of Mechanical & Aerospace Engineering
- Postdoctoral Associate** Jan 2013–Jul 2016  
Massachusetts Institute of Technology (USA)  
Department of Materials Science & Engineering  
Advisors: Michael J. Demkowicz, [demkowicz@tamu.edu](mailto:demkowicz@tamu.edu)  
Chris A. Schuh, [schuh@mit.edu](mailto:schuh@mit.edu)  
Silvija Gradečak, [gradecak@nus.edu.sg](mailto:gradecak@nus.edu.sg)
- Unveiled the role of grain boundaries in hydrogen-assisted fracture of advanced Ni-alloy
  - Developed new methods to assess grain boundary crystallography-property relations

## Research Assistant

Mar 2012–Sep 2012

ETH Zurich (CH)

Department of Materials

Advisor: Ralph Spolenak, [ralph.spolenak@mat.ethz.ch](mailto:ralph.spolenak@mat.ethz.ch)

- Developed analytical and finite element models to predict microstructure evolution of ion-irradiated thin films

## Research Interests

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- Metal additive manufacturing
- Grain boundary engineering
- Ion-beam modification of materials
- High-throughput microstructure analysis
- Environment-assisted failure of structural metals and metal alloys

## Awards

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- Recipient of the TMS Young Innovator in the Materials Science of Additive Manufacturing Award (2023)
- Teaching Fellowship at St John's College, University of Cambridge
- of Awarded the GAP fund (S\$250,000) by NTUitive, to start a spin off company (2022)
- Awarded the certificate of excellence in reviewing for Acta Materialia (2018)
- Recipient of the National Research Foundation Fellowship for 2018 (S\$3,000,000)
- Awarded the Gold Medal for "Young Scientist Session" at AMREE Oil & Gas II, TMS 2015
- Awarded the "Progetto Rocca Seed Fund" for 2014 (\$ 15,000), MIT
- Third place winner of the MIT vs. Harvard Case Competition 2013
- Runner up at the Material Research Prize 2013, ETH Zurich
- Best Poster Award, Gordon Research Conference on Thin Film & Small Scale Mechanical Behavior 2012
- Young Investigator Award, Ion Implantation Technology 2010

## Collaborations with Industry

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### SAFRAN

Aug 2018–Dec 2018

"Directional reflectance microscopy of turbine blades"

### LPW

Jan 2019–ongoing

"High-throughput analysis of metal powder feedstock for AM"

### BeAM

Mar 2019–Aug 2022

"Direct Energy Deposition of Hard Facing Materials"

**HP Corp Lab @ NTU**

Jan 2019–July 2021

“Designing alloys with site-specific properties using additive manufacturing”

**Sembcorp Marine**

Apr 2017–ongoing

“Investigating the role of microstructure on microbially-induced corrosion of metals in different marine environments”

**ST Aerospace**

Aug 2017–ongoing

“Decoupling part geometry from microstructure in directed energy deposition technology”

**Rolls-Royce Corp Lab @ NTU**

Apr 2017–Aug 2018

“Directional Reflectance Microscopy for alloys characterization”

## **Publications (>1500 citations, H=17)**

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(† equal contributor, \* corresponding author)

### **Peer Reviewed Journals**

1. K. P. Davidson, T.-P. Le, L. L. Nguyen, J. E. P. Fronda, R. Liu, T. L. Meng, Y. Y. Tay, M. Seita\*; *Localised control of phase formation in a bearing steel by laser powder bed fusion* (**Under Review**)
2. R. Liu, N. Ivanovich, C. Zhu, Yeo Y. P., X. Wang, M. Seita\*, F. M. Lauro\*; *Influence of grain size and crystallographic orientation on microbially induced corrosion of low-carbon steel in artificial seawater* (**Under Review**)
3. A. T. Clare\*, P. Collins, M. Clark, M. Seita, A. Speidel; *Metals characterisation technology for the factory of the future* (**Under Review**)
4. S. Tekumalla\*, M. Seita, S. Zaefferer; *Delineating dislocation structures and residual stresses in additively manufactured alloys* (**Under Review**)
5. P.-J. Chiang, K. P. Davidson, J. M. Wheeler, A. Ong, K. Erickson, M. Seita\*; *Site-specific alloying through binder jet 3D printing* (**Under Review**)
6. S. Gao, Z. Li, S. Van Petegem, J. Ge, G. Sneha, J. V. Vas, V. Luzin, Z. Hu, H. L. Seet, D. F. Sanchez, H. Van Swygenhoven, H. Gao, M. Seita\*; *Additive manufacturing of alloys with programmable microstructure and properties* **Nature Communications** (ACCEPTED)
7. C. J. Todaro, M. Rashidi, J. E. Fronda, R. L. Liu, S. Gao, T.-P. Le, Y. T. Tang, M. Seita\*; *Laser powder bed fusion of high-strength and corrosion-resistant Inconel alloy 725*, **Materials Characterization** (2022)
8. T. P. Le, X. Wang, M. Seita\*; *An optical-based method to estimate the oxygen content in recycled metal powders for additive manufacturing*, **Additive Manufacturing** (2022)
9. M. J. Demkowicz, M. Liu, I. D. McCue, M. Seita, J. Stuckner, K. Xie; *Quantitative image integration in metals research*, **MRS Communications** (2022)

10. S. Tekumalla\*, C. J. Eng, A. T. Sui Wei, K. Manickavasagam, M. Seita; *Towards 3-D texture control in a beta-titanium alloy via laser powder bed fusion*, **Additive Manufacturing** (2022)
11. X. Wang, S. Yang, M. Seita\*; *Combining polarized light microscopy with machine learning to map crystallographic textures on cubic metals*, **Materials Characterization** (2022)
12. C. Zhu, M. Seita\*; *A physics-based model for crystal orientation indexing by directional reflectance microscopy*, **Acta Materialia** (2022)
13. V. H. Y. Chou, W. C. Liu, M. Wittwer, H. Le Ferrand\*, M. Seita\*; *High-throughput microstructure and composition characterisation of microplatelet reinforced composites using directional reflectance microscopy*, **Acta Materialia** (2022)
14. K. Sofinowski, M. Wittwer, M. Seita\*; *Encoding Data into Metals Using Additive Manufacturing*, **Additive Manufacturing** (2022)
15. M. Wittwer, M. Seita\*; *A Machine Learning Approach to Map Crystal Orientation by Optical Microscopy*, **npj Computational Materials** (2022)
16. Q. Lu, M. Grasso, T-P. Le, M. Seita\*; *Predicting build density in L-PBF through in-situ analysis of surface topography using powder bed scanner technology*, **Additive Manufacturing** (2022)
17. S. Tekumalla, R. Tosi, X. Tan, M. Seita\*; *Directed energy deposition and characterization of high-speed steels with high vanadium content*, **Additive Manufacturing Letters** (2022)
18. M. Seita\*, S. Gao; *Broadening the design space of engineering materials through additive grain boundary engineering*, Invited Viewpoint Article In Microstructure design in metal additive manufacturing – physical metallurgy revisited. For: **Journal of Materials Science** (2022)
19. S. Gao, H. Rui, X. Song, M. Seita\*; *A hybrid direct energy deposition and incremental forming process to manipulate the grain boundary character distribution of stainless steel*, **Materials & Design** (2021)
20. S. Tekumalla, B. Selvarajou, S. Raman, S. Gao, M. Seita\*; *The role of the solidification structure on the orientation-dependent deformation of selective laser melted stainless steel 316L*, **Materials Science and Engineering A** (2021)
21. Y. C. Yeoh, G. Macchi, B. Gaskey, E. Jain, S. Raman, G. Tay, D. Verdi, A. Patran, A. M. Grande, M. Seita\*; *Multiscale microstructural heterogeneity and mechanical property scatter in Inconel 718 produced by directed energy deposition*, **Journal of Alloys and Compounds** (2021)
22. M. Wittwer, B. Gaskey, M. Seita\*; *An Automated and Unbiased Grain Segmentation Method Based on Directional Reflectance Microscopy*, **Materials Characterization** (2021)
23. T. P. Le, X. G. Wang, K. Davidson, J. E. Fronda, M. Seita\*; *Experimental analysis of powder layer quality as a function of feedstock and recoating strategies*, **Additive Manufacturing** (2021)

24. K. A. Sofinowski†, S. Raman†, X. G. Wang, B. Gaskey, M. Seita\*; *Layer-wise engineering of grain orientation (LEGO) in selective laser melted stainless steel 316L*, **Additive Manufacturing** (2021)
25. S. Gao, H. Zhiheng, M. Duchamp, P. S. S. Rama Krishnan, S. Tekumalla, S. Xu, M. Seita\*; *Recrystallization-based grain boundary engineering of 316L stainless steel produced via selective laser melting*, **Acta Materialia** (2020)
26. T. Zheng, X. Wang, E. Jain, D. Kramer, R. Mönig, M. Seita, S. T. Boles; *Granular Phase Transformation of Polycrystalline Aluminum during Electrochemical Lithiation*, **Scripta Materialia** (2020)
27. V. K. Murugan, H. Mohanaram, M. Budanovic, A. Latchou, R. D. Webster, A. G. T. Miserez\*, M. Seita\*; *Accelerated corrosion of marine-grade steel by a redox-active, cysteine-rich barnacle cement protein*, **npj Materials Degradation** (2020)
28. B. Gaskey, L. Hendl, X. Wang, M. Seita\*; *Optical Characterization of Grain Orientation in Crystalline Materials*, **Acta Materialia** (2020)
29. Wang X., Gao S., E. Jain, B. Gaskey, M. Seita\*; *Measuring crystal orientation from etched surfaces via directional reflectance microscopy*, **Journal of Materials Science** (2020)
30. N. Maharjan†, V. K. Murugan†, W. Zhou, M. Seita; *Corrosion behavior of laser-hardened 50CrMo4 (AISI 4150) steel: A depth-wise analysis*, **Applied Surface Science** (2019)
31. S. Zhou, M. Seita\*; *Large-area surface topography analysis of additively manufactured metallic materials using directional reflectance microscopy*, **Materials Science and Engineering: A** (2019), Invited Contribution
32. M. Liu, M. Seita, T. Duong, C. H. Kuo, M. J. Demkowicz; *Preferential corrosion of coherent twin boundaries in pure nickel under cathodic charging*, **Physical Review Materials** (2019)
33. T. P. Le, M. Seita\*; *A high-resolution and large field-of-view scanner for in-line characterization of powder bed defects during additive manufacturing*, **Materials & Design** (2018)
34. M. Seita, J. P. Hanson, S. Gradečak, M. J. Demkowicz; *Probabilistic failure criteria for individual microstructural elements: an application to hydrogen-assisted crack initiation in alloy 725*, **Journal of Materials Science** (2017)
35. H. Ma, F. Lamattina, I. Shorubalko, R. Spolenak, M. Seita\*; *Engineering the grain boundary network of thin films via ion-beam irradiation: Towards improved electromigration resistance*, **Acta Materialia** (2017)
36. M. Seita\*, M. M. Nimerfroh, M. J. Demkowicz; *Acquisition of partial grain orientation information using optical microscopy*, **Acta Materialia** (2017)
37. M. Seita\*, M. Volpi, S. Patala, I. McCue, C. A. Schuh, M. V. Diamanti, J. Erlebacher, M. J. Demkowicz; *A high-throughput technique for determining grain boundary character non-destructively in microstructures with through-thickness grains*, **npj Computational Materials** (2016)

38. M. Seita†, J. P. Hanson†, S. Gradečak, M. J. Demkowicz; *The dual role of coherent twin boundaries in hydrogen embrittlement*, **Nature Communications** (2015)
39. M. Seita, A. S. Sologubenko, F. Fortuna, M. J. Süess, R. Spolenak; *On the peculiar deformation mechanism of ion-induced texture rotation in thin films*, **Acta Materialia** (2014)
40. M. Seita, R. Schäublin, M. Döbeli, R. Spolenak; *Selective ion induced grain growth: thermal spike modeling and its experimental validation*, **Acta Materialia** (2013)
41. A. Röthlisberger†, M. Seita†, A. Reiser, E. Shawat, R. Spolenak, G. D. Nessim; *Investigating the mechanism of collective bidirectional growth of carbon nanofiber carpets on metallic substrates*, **Carbon** (2013)
42. A. Furrer, M. Seita, R. Spolenak; *The effects of defects in purple AuAl<sub>2</sub> thin films*, **Acta Materialia** (2013)
43. M. Seita, A. Reiser, R. Spolenak; *Ion-induced grain growth and texturing in refractory thin films – a low temperature process*, **Applied Physics Letters** (2012)
44. M. Seita, D. Muff, R. Spolenak; *Multi-directional self-ion irradiation of thin gold films: A new strategy for achieving full texture control*, **Acta Materialia** (2011)
45. G. D. Nessim†, M. Seita†, D. L. Plata, K. P. O'Brien, A. J. Hart, E. R. Meshot, C. M. Reddy, P. M. Gschwend, C. V. Thompson; *Precursor gas chemistry determines the crystallinity of carbon nanotubes synthesized at low temperature*, **Carbon** (2011)
46. M. Seita, C. M. Pecnik, S. Frank, R. Spolenak; *Direct evidence for stress-induced texture evolution and grain growth of silver thin films upon thermal treatment and self-ion bombardment*, **Acta Materialia** (2010)
47. G. D. Nessim, M. Seita, K. P. O'Brien, S. A. Speakman; *Dual formation of carpets of large carbon nanofibers and thin crystalline carbon nanotubes from the same catalyst-underlayer system*, **Carbon** (2010)
48. G. D. Nessim, D. Acquaviva, M. Seita, K. P. O'Brien, C. V. Thompson; *The critical role of the underlayer material and thickness in growing vertically aligned carbon nanotubes and nanofibers on metallic substrates by chemical vapor deposition*, **Advanced Functional Materials** (2010)
49. G. D. Nessim, M. Seita, K. P. O'Brien, A. J. Hart, R. K. Bonaparte, R. R. Mitchell, C. V. Thompson; *Low temperature synthesis of vertically aligned carbon nanotubes with electrical contact to metallic substrates enabled by thermal decomposition of the carbon feedstock*, **Nano Letters** (2009)
50. M. Dietiker, S. Olliges, M. Schinhammer, M. Seita, R. Spolenak; *Texture evolution and mechanical properties of ion-irradiated Au thin films*, **Acta Materialia** (2009)
51. G. D. Nessim, A. J. Hart, J. S. Kim, D. Acquaviva, J. H. Oh, C. D. Morgan, M. Seita, J. S. Leib, C. V. Thompson; *Tuning of vertically-aligned carbon nanotube diameter and areal density through catalyst pre-treatment*, **Nano Letters** (2008)

## Conference Proceedings

1. M. Seita<sup>\*</sup>, T.-P. Le, C. Zhu; *Optical Orientation Mapping of Additively Manufactured Alloys Using Directional Reflectance Microscopy*, **Microscopy and Microanalysis** (2023)
2. F. Lauro, L.E. Doyle, P. Rajala, E. Marsili, J. Hinks, M. Seita, S.A. Rice; “*Rust in the Abyss: Investigating the Effects of High Hydrostatic Pressure on Microbially Influenced Corrosion*”, **Ocean Sciences Meeting** (2020)
3. B. Nagarajan, Z. Hu, S. Gao, X. Song, R. Huang, M. Seita, J. Wei; “*Effect of In-Situ Laser Remelting on the Microstructure of SS316L Fabricated by Micro Selective Laser Melting*”, **International Conference on Advanced Surface Enhancement** (2019)
4. Y. K. Chen-Wiegart, G. Williams, C. Zhao, H. Jiang, L. Li, M. J. Demkowicz, M. Seita, M. Short, S. Ferry, T. Wada, H. Kato, K. W. Chou, S. Petrash, J. Catalano, Y. Yao, A. Murphy, N. Zumbulyadis, S. A. Centeno, C. Dybowski, J. Thieme; *Early science commissioning results of the sub-micron resolution X-ray spectroscopy beamline (SRX) in the field of materials science and engineering*, **AIP Conference Proceedings** (2016)
5. J. P. Hanson<sup>†</sup>, M. Seita<sup>†</sup>, S. Gradečak, M. J. Demkowicz; *Investigation of hydrogen embrittlement behavior in precipitation hardened Ni-base alloys*, **CORROSION NACE** (2015)

## In preparation

1. K. Davidson, P.-J. Chiang, M. Seita<sup>\*</sup>; *Phase control in laser powder bed fusion of steel*.
2. X. Wang, Q. Lu, M. Seita<sup>\*</sup>, The influence of laser beam diameter on the microstructure and mechanical properties of stainless steel 316L produced by pulsed-LPBF
3. Q. Lu, X. Wang, M. Seita<sup>\*</sup>, *Effect of hatch spacing, scanning strategy and layer thickness on texture evolution of stainless steel 316L produced via laser powder bed fusion*

## Books & Other publications

1. M. Seita<sup>\*</sup>, M. Wittwer, X. Wang, *Optical Metallography of Fusion-Based Additively Manufactured Metals*, In: Francisca G. Caballero (ed.), **Encyclopedia of Materials: Metals and Alloys**. vol. 3, pp. 193–202. Oxford: Elsevier (2022)
2. M. Seita, *Full microstructure control through ion-induced grain growth, texturing and constrained deformation in thin metal films*, Editor: Lidia Cojocar, **LAP LAMBERT Academic Publishing** (2015)
3. G. D. Nessim, M. Seita; *The role of cobalt in carbon nanotubes synthesis*, chapter in the edited and peer-reviewed collection: *Cobalt: Characteristics*,

## Patents

1. P-J. Chian, K. P. Davidson, M. Seita, K. Erickson; *Diffusion control in binder jet additive manufacturing*, **Provisional Patent** (1 September 2021).
2. K. P. Davidson, S. Gao, M. Seita; *Phase control in laser powder bed fusion additive manufacturing*, **PCT/US20230141138A1** (11 November 2021).
3. S. Gao, M. Seita; *Site-Specific Grain Boundary Engineering of Additively Manufactured Steel*, **PCT/SG2022/050220** (13 April 2022)
4. K. P. Davidson, P-J. Chian, M. Seita; *Site specific microstructure control using binder jet additive manufacturing*, **PCT/US2022/014331** (28 January 2022)
5. B. Gaskey, L. Hendl, M. Seita; *Method And Apparatus For Determining Crystallographic Orientation On Crystalline Surfaces*, **WO2021080515A1** (24 October 2019)
6. T. P. Le, M. Seita; *A Layer-Wise Scanner For In-Line Characterization Of Defects During Additive Manufacturing*, **WO2020046212A1** (30 August 2018)
7. M. Seita, K. Zeng, R. Spolenak; *Method for the production of biaxially textured films and films obtained using such a method*, **WO2011138019A1** (05 May 2010)

## Invited Seminars

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1. *Microstructure heterogeneity in metal additive manufacturing: A double-edged sword?*, Oxford University, UK (2023)
2. *Microstructure heterogeneity in metal additive manufacturing: A double-edged sword?*, Washington & Lee University, VA (2023)
3. *Microstructure heterogeneity in metal additive manufacturing: A double-edged sword?*, University of Manchester, UK (2023)
4. *Microstructure heterogeneity in metal additive manufacturing: A double-edged sword?*, University of Cambridge, UK (2022)
5. *Microstructure heterogeneity in metal additive manufacturing: A double-edged sword?*, Norwegian University of Science and Technology, NO (2022)
6. *Microstructure heterogeneity in metal additive manufacturing: A double-edged sword?*, University of Turku, FI (2021)
7. *Microstructure heterogeneity in metal additive manufacturing: A double-edged sword?*, Aarhus University, DK (2021)
8. *Grain boundary engineering of stainless steel 316L via laser powder bed fusion*, University of Sydney, AU (2021)
9. *Assessing crystallographic information in metals by means of optical microscopy*, Texas A&M, TX (2018)



10. *Assessing crystallographic information in polycrystalline metals using optical microscopy*, University of Rochester, NY (2017)
11. *Assessing crystallographic information in polycrystalline metals using optical microscopy*, Università Roma 3, IT (2017)
12. *Assessing crystallographic information in polycrystalline metals using optical microscopy*, Politecnico di Milano, IT (2017)
13. *Improving materials reliability by defect engineering*, Johns Hopkins University, MD (2016)
14. *Improving materials reliability by defect engineering*, Nanyang Technological University, SGP (2016)
15. *Grain boundaries as a materials design tool*, Technische Universität München, DE (2016)
16. *Improving materials reliability by defect engineering*, University of Pennsylvania, PA (2016)
17. *High-throughput measurements of grain boundary properties*, Michigan State University, MI (2015)
18. *Improving materials reliability by defect engineering*, North Carolina State University, NC (2015)
19. *Grain boundaries as a materials design tool*, Imperial College London, UK (2015)
20. *Improving materials reliability by defect engineering*, University of California Santa Barbara, CA (2015)
21. *Improving materials reliability by defect engineering*, University of Minnesota, MN (2014)
22. *Microstructure characterization of polycrystals by electron backscatter diffraction*, Politecnico di Milano, IT (2014)
23. *Microstructure control in thin metal films through ion bombardment*, Materials Research Center Colloquium 2013, CH (2013)
24. *Full microstructure control through ion-induced texturing, grain growth and constrained deformation in thin metal films*, Cornell University, NY (2012)

## **Invited & Keynote Talks**

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1. *Optical orientation measurements of additively manufactured metal alloys*, M&M 2023, MN
2. *Microstructure heterogeneity in metal additive manufacturing: A double-edged sword?*, ESIA17–ISSI2023, UK
3. *Tuning the mechanical properties of steels using additive manufacturing*, MecaNano 23, ES
4. **Keynote** - *Microstructure design freedom in metal AM: a LEGO analogy*, Additive Manufacturing Keynote Session, TMS 2023, CA

5. *Designing materials with heterogeneous microstructure via additive manufacturing*, TMS 2023, CA
6. **Keynote** - *Microstructure control in metal additive manufacturing: a LEGO analogy*, Alloy for Additive Manufacturing Symposium 2022, Munich (DE)
7. *Microstructure heterogeneity in metal additive manufacturing: A double edged sword?*, ASTM International Conference on Additive Manufacturing 2021, CA (Virtual)
8. *Grain boundary engineering of stainless steel 316L via laser powder bed fusion*, CAMP-NANO 2021, CN (Virtual)
9. *Microstructure and property variability in DED Inconel 718 as a function of build rate*, MS&T 2020, FL (Virtual)
10. *Engineering the plasticity of SLM steel via crystallographic texture control*, MS&T 2020, FL (Virtual)
11. *Unveiling the relationships between powder bed conditions and materials quality during selective laser melting*, MS&T 2020, FL (Virtual)
12. **Keynote** - *Metallography 2.0: Assessing crystal orientation information using optical microscopy*, GRC on thin Films and Small Scale Mechanical Behavior 2018, ME
13. *Assessing microstructure variability in large scale 3-D printed metallic materials*, CAMP-NANO 2018, CN
14. *Assessing crystallographic orientation in polycrystalline metals by means of optical microscopy*, CAMP-NANO 2017, CN
15. *The role of grain boundary character in H-assisted intergranular fracture*, TMS 2015, FL
16. *Microstructure engineering of metal thin films by ion bombardment*, Materials for Harsh Environment 2009, DE

## **Research Programs (past & ongoing)**

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### Micro-Mechanical Testing of Metals with Architected Microstructure

- *Sponsor*: Isaac Newton Trust
- *Project duration*: Feb 2023 – Jan 2024
- *Total support*: £53,000
- *Role*: Lead PI

### Grain boundary engineering of additively manufactured alloys

- *Sponsor*: MOE
- *Project duration*: May 2022 – Apr 2025
- *Total support*: S\$741,150
- *Role*: Lead PI

### Molecular barcoding and detection of plastic: from basic science to environmental policy

- *Sponsor*: MOE

- *Project duration:* Feb 2022 – Jan 2025
- *Total support:* S\$199,100
- *Role:* Co-PI

*Additive Manufacturing of Space-Grade, Lightweight Plasma Thruster Components of Complex Structures for Commercial Small Satellites*

- *Sponsor:* NRF
- *Project duration:* Aug 2019 – Feb 2020
- *Total support:* S\$15,750
- *Role:* Lead PI

*Unlocking the secrets of microbially influenced corrosion: From detection to control mechanisms*

- *Sponsor:* NRF Competitive Research Program
- *Project duration:* Feb 2020 – Jan 2025
- *Total support:* S\$744,000
- *Role:* Co-PI

*Direct Energy Deposition of Hard Facing Materials*

- *Sponsor:* BeAM
- *Project duration:* Mar 2019 – Aug 2021
- *Total support:* S\$240,000
- *Role:* Lead PI

*Designing alloys with site-specific properties using additive manufacturing*

- *Sponsor:* HP
- *Project duration:* Jan 2019 – July 2021
- *Total support:* S\$3,128,400
- *Role:* Lead PI

*3D printed carbon steel with locally optimized microstructures for marine applications*

- *Sponsor:* NTU-CSIRO Seed Fund
- *Project duration:* Apr 2018 – Mar 2020
- *Total support:* S\$108,000
- *Role:* Lead PI

*Assessing crystallographic information in metals via optical microscopy*

- *Sponsor:* MOE
- *Project duration:* Jun 2018 – Feb 2022
- *Total support:* S\$756,060
- *Role:* Lead PI

*Layerwise microstructure scanner: A new technology for online materials assessment in additive manufacturing*

- *Sponsor:* NRF
- *Project duration:* Feb 2018 – Jan 2023
- *Total support:* S\$2,714,436
- *Role:* Lead PI

Investigating the role of microstructure on microbially-induced corrosion of metals in different marine environments

- Sponsor: NTU College of Engineering
- Project duration: Apr 2017 – Mar 2020
- Total support: S\$277,000
- Role: Lead PI

Decoupling part geometry from microstructure in directed energy deposition technology

- Sponsor: ST Aerospace
- Project duration: Aug 2017 – Aug 2021
- Total support: S\$250,000
- Role: Lead PI

Directional Reflectance Microscopy for alloys characterization

- Sponsor: Rolls-Royce Corp Lab @ NTU
- Project duration: Apr 2017 – Aug 2018
- Total support: S\$141,700
- Role: Lead PI

Additive microstructure engineering: a new technology for improving materials reliability

- Sponsor: NTU internal funding
- Project duration: Oct 2016 – Mar 2022
- Total support: S\$300,000
- Role: Lead PI

## **Consulting**

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### **SAFRAN**

“Directional reflectance microscopy of turbine blades” (Dec 2018–Dec 2020)

## **Mentorship**

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(\* Co-supervised)

### **Bachelor theses supervised**

- Christina M. Pecnik\*: *The Effects of Annealing on the Microstructure of Gold and Silver Thin Films after High Energy Ion Bombardment Treatments*, 2009 (ETH Zurich, Department of Materials, student advised by R. Spolenak)
- Zoran Ostojic\*: *Electrical characterization of self-ion bombarded thin silver films with Van-der-pauw measurement system*, 2011 (ETH Zurich, Department of Materials, student advised by R. Spolenak)

### **Master theses supervised**

- Ke Zeng\*: *Converting Polycrystals into Single Crystals by Low Energy Ion Bombardment*, 2009 (ETH Zurich, Department of Materials, student advised by R. Spolenak)
- Daniel Muff\*: *Full Microstructure Control in Au, Ag and Pd Thin Films by High-Energy Ion Bombardment*, 2010 (ETH Zurich, Department of Materials, student advised by R. Spolenak)
- Annika Baier\*: *Large Scale Production of Biaxially Textured Thin Metallic Films*, 2010 (ETH Zurich, Department of Materials, student advised by R. Spolenak)
- André Röthlisberger\*: *Underlayer Microstructure Engineering by High Energy Ion Bombardment and Effects on Carbon Nanotube Growth*, 2011 (ETH Zurich, Department of Materials, student advised by R. Spolenak)
- Alain Reiser\*: *Thin-film Microstructure Engineering and Effects on Carbon Nanotube growth*, 2012 (ETH Zurich, Department of Materials, student advised by R. Spolenak)
- Marco Volpi\*: *Correlating grain boundary crystallography to aluminum corrosion: Development of characterization methodology*, 2014 (MIT, Department of Materials Science and Engineering, student advised by M. J. Demkowicz)
- Anshul Sharma: *How much Permeable is a Metal? Inferring Aluminum Permeability to Liquid Gallium from Optical Microscopy Measurements*, 2017 (NTU, School of Mechanical and Aerospace Engineering)
- Xiogang Wang: *Quantitative polarized light microscopy for additive manufacturing*, 2018 (NTU, School of Mechanical and Aerospace Engineering)
- Shiqi Zhou: *Quantitative analysis of surface texture in 3D printed metallic materials*, 2018 (NTU, School of Mechanical and Aerospace Engineering)
- Vladimir Vojtech: *Mapping grain boundary properties using high-throughput experiments*, 2018 (ETH Zurich, Switzerland)
- Yang Yulai: *An automated platform for obtaining microstructure information from metals and metal alloys using optical microscopy*, 2018 (NTU, School of Mechanical and Aerospace Engineering)
- Siboy Yang: *A novel method for in-line defect assessment during powder bed fusion processes*, 2019 (NTU, School of Mechanical and Aerospace Engineering)
- Emilien Chevallier: *Using machine learning to assess grain orientation information from optical micrographs*, 2019 (Phelma, France)
- Arvind Latchou: *Investigating the role microstructure on microbially influenced corrosion*, 2019 (Phelma, France)
- Ludwig Hendl: *Directional reflectance microscopy of polycrystalline solar cells*, 2019 (University of Hamburg, Germany)
- Ambika Soram: *High-throughput measurements of grain boundary properties*, 2019 (NTU, School of Mechanical and Aerospace Engineering)
- Guido Macchi: *Microstructure and mechanical properties of DED Inconel 718*, Expected in spring 2020 (Politecnico di Milano, Italy)

- Vidhukiran Venkataraman: *Directional reflectance microscopy*, 2019 (NTU-India connect program)

### **Doctoral theses supervised (+ Graduated)**

- Le Tan Phuc<sup>+</sup>: *A novel inline monitoring technique for powder bed fusion metal additive manufacturing*, 2017—2021 (NTU, School of Mechanical and Aerospace Engineering)
- Ekta Jain<sup>+</sup>: *Surface engineering of metals via metallographic etching for microstructural characterization*, 2017—2021 (NTU, School of Mechanical and Aerospace Engineering)
- Yong Chen Yeoh<sup>+</sup>: *Decoupling part geometry from microstructure in directed energy deposition technology*, 2017—2021 (NTU, School of Mechanical and Aerospace Engineering)
- Shubo Gao<sup>+</sup>: *Recrystallization-based grain boundary engineering of additively manufactured metals*, 2018—2022 (NTU, School of Mechanical and Aerospace Engineering)
- Xiogang Wang<sup>+</sup>: *Towards In-Situ Texture Analysis During LPBF: Optical microscopy and texture control*, 2018—2022 (NTU, School of Mechanical and Aerospace Engineering)
- Po-Ju Chiang<sup>\*</sup>: *Site-specific alloying using binder jetting technology*, 2019—2023 (NTU, School of Mechanical and Aerospace Engineering)
- Yeo Yee Phan<sup>\*</sup>: *Microbially-Influenced Corrosion by Sulfate-Reducing Bacteria in Deep-sea Environment*, 2019—2023 (NTU, School of Biological Sciences)
- Nicolo Ivanovich<sup>\*</sup>: *Role of bacterial communities in deep sea water corrosion of carbon steel*, 2020—2024 (NTU, Asian School of the Environment)
- Chengyang Zhu<sup>\*</sup>: *High-throughput measurements of grain boundary properties*, 2020—2024 (NTU, School of Mechanical and Aerospace Engineering)
- Feng Ji Crystal<sup>\*</sup>: *Designing alloys with engineered plasticity through layerwise texture control during AM*, 2022—2026 (NTU, School of Mechanical and Aerospace Engineering)
- Alpravinosh Alagesan<sup>\*</sup>: *In-situ powder measurements for sustainable additive manufacturing*, 2022—2026 (NTU, School of Mechanical and Aerospace Engineering)
- Dylan Cuskelly: *Novel 3D printing strategies to produce high performance, nanostructured steels*, 2023—2027 (University of Cambridge, EPSRC CDT in Nanoscience and Nanotechnology)
- Samuel Taylor: *Mechanical chiral metamaterials*, 2023—2027 (University of Cambridge, Department of Engineering)

### **Research staff supervised**

- Saritha K. Samudrala: *Directional reflectance microscopy for alloys characterisation*, 2017—2018 (NTU, School of Mechanical and Aerospace Engineering)

- Vinod K. Murugan: *Investigating the role of microstructure on microbially-induced corrosion of metals in different marine environments*, 2017—2020- (NTU, School of Mechanical and Aerospace Engineering)
- Ajinkya Kale: *Mapping coherent twin boundaries using directional reflectance microscopy*, 2017—2018 (NTU, School of Mechanical and Aerospace Engineering)
- Sudarshan Raman: *3D printed carbon steel with locally optimized microstructure for Marine applications*, 2018—2021 (NTU, School of Mechanical and Aerospace Engineering)
- Shiqi Zhou: *Quantitative analysis of surface texture in 3D printed metallic materials*, 2018—2019 (NTU, School of Mechanical and Aerospace Engineering)
- Karl Peter Davidson: *Multi-functional metallic materials via multi-jet printing processes*, 2018—2022 (NTU, School of Mechanical and Aerospace Engineering)
- Bernard Gaskey: *Crystal orientation mapping by directional reflectance microscopy*, 2018—2020 (NTU, School of Mechanical and Aerospace Engineering)
- Mallory Wittwer: *Application of machine learning to directional reflectance microscopy*, 2018—2021 (NTU, School of Mechanical and Aerospace Engineering)
- Masoud Rashidi: *Novel microstructure designs of advanced alloys using selective laser melting*, 2019—2021 (NTU, School of Mechanical and Aerospace Engineering)
- Tekumalla Venkata Rama Lakshmi Sravya: *Fatigue behavior of Additively Manufactured  $\beta$ -type Titanium Alloys for Biomedical Applications*, 2019—2021 (NTU, Presidential postdoctoral Fellowship)
- Karl A. Sofinowski: *Microstructure control during metal additive manufacturing*, 2020—2022 (NTU, School of Mechanical and Aerospace Engineering)
- Riccardo Tosi: *Directed energy deposition of hard-facing materials*, 2020—2021 (NTU, School of Mechanical and Aerospace Engineering)
- Qingyang Lu: *In-line monitoring of surface microstructure during selective laser melting*, 2020—2022 (NTU, School of Mechanical and Aerospace Engineering)
- Carmelo Todaro: *Site-specific texture control in SLM*, 2020—2022 (NTU, School of Mechanical and Aerospace Engineering)
- Ruiliang Liu: *The role of microstructure on microbially-influenced corrosion*, 2021—2022 (NTU, School of Mechanical and Aerospace Engineering)

## Classes Taught

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- ExA Product Disassembly, *Lab Coordinator*** 2023–present  
University of Cambridge, Department of Engineering
- 3C1/3P1 Materials Processing and Design, *Lecturer*** 2022–present  
University of Cambridge, Department of Engineering
- 3D printing of a puzzle keychain, *Experiment coordinator*** 2018–present  
NTU, School of Materials Science and Engineering
- Third year laboratory course for MSE undergraduate students
- Fundamentals of Engineering Materials, *Lecturer & Course coordinator*** 2017–present  
NTU, School of Mechanical and Aerospace Engineering
- First year core class for MAE undergraduate students
  - Current Student Teaching Feedback: 88/100 (School average 86/100)
- Manufacturing Processes, *Teaching Assistant*** Spring 2017  
NTU, School of Mechanical and Aerospace Engineering
- Second year core class for MAE undergraduate students
- Fundamentals of Materials Science, *Teaching Assistant*** Fall 2013  
MIT, Department of Materials Science & Engineering
- Elective for materials science and engineering undergraduate students

## Service

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### Administrative

- Representative member from Division C (Mechanics, Materials & Design) of the Engineering Degree Committee at the Department of Engineering, University of Cambridge
- User Committee Member of the Facility for Analysis Characterization, Testing, and Simulation (FACTS) at NTU

### Meeting organization

- Co-organizer of the symposium “Materials Processing and Kinetic Phenomena: from Thin Films and Micro/Nano Systems to Advanced Manufacturing” at TMS 2024 (FL)



- Co-chair of symposium “Mechanics of Structural Metals” at ICMGC 2024 (Singapore)
- Lead organizer of symposium “Materials for Additive Manufacturing: From Fundamentals to Applications” at ICMAT 2019 (Singapore)

### **Special initiatives**

- MRS Postdoctoral Award committee member (2022-2025)
- Judge for A\*STAR Talent Search competition

### **Editorial**

- Editorial board member for Materials Today Communications (From November 2020 to January 2022)
- Co-editor of focus issue on “Additive Manufacturing of Metals: Complex Microstructures and Architecture Design” for the Journal of Materials Research (August 2020)

### **Reviewing**

- Nature Communications
- npj Computational Materials
- Acta Materialia
- Scripta Materialia
- Additive Manufacturing
- Additive Manufacturing Letters
- Materials & Design
- Materials Characterization
- Journal of Materials Science
- Materials Today Communications
- Scientific Reports
- Virtual and Physical Prototyping
- Sensors