

Deborah C. Blaine

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EDUCATIONAL QUALIFICATIONS

PhD (Engineering Science and Mechanics)	The Pennsylvania State University, USA	2004
BEng (Mechanical Engineering)	Stellenbosch University, South Africa	1996

PROFESSIONAL EXPERIENCE

Associate Professor	2017 -
Senior Lecturer	2007 - 2016

Mechanical and Mechatronic Engineering

University of Stellenbosch, Stellenbosch, South Africa

- Lecture undergraduate modules in Materials Science for Engineers and Strength of Materials
- Supervise final year, MSc and PhD Mechanical Engineering student projects
- Establish and manage research projects in Materials with special emphasis on Powder Metallurgy

Deputy Manager – Materials Research and Development 2006

Research Engineer 2005

Bleistahl Productions GmbH & KG. Co, Wetter, Germany

- Project and team management
- Developed new materials for sintered automotive valve train components
- Conducted production control through materials analysis

Research Engineer/Post-doctorate 2004 – 2005

Graduate Research Assistant 2000 – 2004

Center for Innovative Sintered Products (CISP)

The Pennsylvania State University, University Park, PA, USA

- Computer simulation and modelling of particulate systems and materials
- Penn State Project Manager for National Institute of Science and Technology (NIST): Advanced Technologies Program (ATP) project: “Metal Injection Molding of Large Components”
- Proxy-lecture senior Introduction to Materials Science for Engineers class
- Consulted on numerous diverse industry-driven projects involving particulate materials
- Proxy-lectured sophomore Mechanical Behaviour of Materials, freshman Strength of Materials and graduate Powder Metallurgy classes
- Project coordination, research and supervision of undergraduate laboratory assistants for NIST/ATP project: “Metal Injection Molding of Large Components”

Post-graduate student assistant 1997 – 1999

Stellenbosch University, Stellenbosch, South Africa

- Programmed spreadsheets for analysis of the draft in solar chimneys for renewable energy project
- Teaching/laboratory assistant for undergraduate Fluid Mechanics and Thermodynamics

Undergraduate student intern 1993 – 1995

Powdermet (Pty) Ltd, Cape Town, South Africa

- Designed P/M tooling and parts for conventional die compaction using AutoCAD R14
 - Executed production line quality control inspections and equipment maintenance
 - Co-supervised implementation of ISO 9000 quality standards in factory
 - Overhauled continuous belt sintering furnace, including gas-welding of molybdenum heating elements
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POST-GRADUATE SUPERVISION

PhD: 1 graduate

- Michael Hindley, graduated March 2015 (primary co-supervisor)

Masters (MSc, MEng): 10 graduates (4 currently enrolled)

- Adriaan Smuts, graduated March 2010 (secondary co-supervisor)
- Kolawale Sobiyi, graduated March 2011 (supervisor)
- Alexander Ilchev, UWC, graduated December 2011 (primary co-supervisor)
- Laurus Basson, graduated December 2010 (supervisor)
- Ian Kemp, graduated December 2012 (secondary co-supervisor)
- Werner van Zyl, graduated *cum laude* December 2014 (supervisor)
- Hendrik Bosman, graduated March 2016 (supervisor)
- Gerrit ter Haar, graduated *cum laude* March 2017 (secondary co-supervisor)
- Heimriks Nel, graduated *cum laude* December 2017 (primary co-supervisor)
- Jessica du Toit, graduating March 2018 *cum laude* (primary co-supervisor)

SHORT COURSES AND TRAINING

HERS-SA

Leadership for women in higher education Aug 2015

SASEE

HEQF & Curriculum design June 2012

Let ICTs work for you Nov 2014

Cape Higher Education Council, Cape Town, South Africa
Teaching and Learning in Higher Education 2010

Stellenbosch University, Stellenbosch, South Africa

Center for Teaching and Learning, Blended Learning 2015

Center for Teaching and Learning, iSpring7.0 2015

Center for Teaching and Learning, Assessment I May 2008

Predac Lecturer's Training Course Jan 2007

Höganäs AB, Sweden

Advanced Microstructural Analysis for Powder Metallurgy Sept 2005

Innovative Materials Solutions, State College, PA, USA

Metallography & Microstructural Analysis Apr 2002

Powder Analysis and Characterization Jun 2001

Sintering – Concepts and Practice May 2001

Understanding Binders and Lubricants Mar 2001

Powder Injection Molding Tutorial Oct 2000

Dr. Sylvana Luyckx, Cape Town, South Africa Aug 1999

Short Course in Powder Metallurgy

PUBLICATIONS, PRESENTATIONS AND PATENTS

Journal publications (peer-reviewed)

1. "Two-Phase Master Sintering Curve for 17-4 PH Stainless Steel" by Im Doo Jung, Sangyul Ha, Seong Jin Park, Deborah C. Blaine, Ravi Bollina, and Randall German, *Metallurgical and Materials Transactions A* 2016; **47A**(11):5548-5556
2. "Application of microCT to the non-destructive testing of an additive manufactured titanium component" by Anton du Plessis, Stephan G. le Roux, Johan Els, Gerrie Booyesen, Deborah C. Blaine, Case Studies in Nondestructive Testing and Evaluation, Vol. 4, 2015, pp.1-7
3. "Failure Prediction of Full-Size Reactor Components from Tensile Specimen Data on NBG-18 Nuclear Graphite" by Michael P. Hindley, Deborah C. Blaine, Thorsten Becker and Albert A. Groenwold, *Nuclear Engineering and Design*, Volume 284, July 2015, Pages 1-9.
4. "Optimisation of the link volume for weakest link failure prediction in NBG-18 nuclear graphite" by Michael P. Hindley, Deborah C. Blaine, Thorsten Becker and Albert A. Groenwold, *Nuclear Engineering and Design*, Volume 274, July 2014, Pages 10-19.
5. "Experimental validation of the fluid–structure interaction simulation of a bioprosthetic aortic heart valve" by I. Kemp, K. Dellimore, R. Rodriguez, C. Scheffer, D. Blaine, H. Weich & A. Doubell, *Australasian Physical & Engineering Sciences in Medicine*, Vol 36 No 3, 2013, pp. 363-373
6. "A Numerical Stress Based Approach for Predicting Failure in NBG-18 Nuclear Graphite Components with Verification Problems" by Michael P. Hindley, Mark N. Mitchell, Thorsten Becker, Deborah C. Blaine, and Albert A. Groenwold, *Journal of Nuclear Materials*, Volume 436, Issues 1-3, May 2013, Pages 175-184
7. "Observations in the statistical analysis of NBG-18 nuclear graphite strength tests" by Michael P. Hindley, Mark N. Mitchell, Deborah C. Blaine, and Albert A. Groenwold, *Journal of Nuclear Materials*, Volume 420, Issues 1–3, January 2012, Pages 110-115
8. "Application of fine element analysis to the design of tissue leaflets for a percutaneous aortic valve" by A.N. Smuts, D.C. Blaine, C. Scheffer, H. Weich, A.F. Doubell, K.H. Dellimore *Journal of the Mechanical Behavior of Biomedical Materials*, Volume 4, Issue 1, January 2011, Pages 85-98
9. "Application of Work-of-Sintering Concepts in Powder Metals" by D. C. Blaine, S. J. Park, P. Suri, and R. M. German, *Metallurgical and Materials Transactions A*, Vol. 37A, No. 9, September 2006, pp. 2827- 2835
10. "Master Sintering Curve Concepts as Applied to the Sintering of Molybdenum" by D.C. Blaine, J.D. Gurosik, S-J. Park, D.F. Heaney and R.M. German, *Metallurgical and Materials Transactions A*, Vol. 37A, No. 3, March 2006, pp.715 – 720
11. "Critical Use of Video-Imaging to Rationalize Computer Sintering Simulation Models" by D. C. Blaine, R. Bollina, S-J. Park and R. M. German, *Computers in Industry - Special Issue: Machine Vision*, Vol. 56, Issues 8-9, December 2005, pp. 867-875
12. "Finite Element Simulation of Sintering Shrinkage and Distortion in Large PIM Parts" by D. Blaine, S.H. Chung, S.J. Park, P. Suri and R.M. German, *PM Science and Technology Briefs*, Vol.6., No.2., August 2004, pp. 13-18
13. "Effects of residual carbon content on sintering shrinkage, microstructure and mechanical properties of injection molded 17-4 PH stainless steel" by Y.Wu, R.M. German, D. Blaine, B. Marx and C. Schlaefer, *Journal of Materials Science*, Vol.37, 2002, pp. 3573-3583
14. "Sintering Densification and Microstructural Evolution of Injection Molding Grade 17-4 PH Stainless Steel Powder" by Y. Wu, D. Blaine, B. Marx, C. Schlaefer, and R.M. German, *Metallurgical and Materials Transactions A*, Vol. 33A, July 2002, pp.2185-2194

15. "Analysis of the Driving Potential of a Solar Chimney Power Plant" by D.G. Kröger and D. Blaine, *R&D Journal (a publication of the South African Institution of Mechanical Engineers)*, vol. 15, No. 3, 1999, pp. 85-94 (see AWARDS AND SCHOLARSHIPS)

Peer-review conference publications

1. "Reflections on solving problems: Teaching and learning" by D Blaine, Proceedings of the 4th Biennial Conference of the South African Society for Engineering Education, Cape Town, July 2017, 29-39
2. "Tool wear during machining of sintered titanium and Ti6Al4V alloy" by D.C. Blaine, Proceedings of the World Powder Metallurgy 2016 Congress and exhibition, Hamburg, Germany, European Powder Metallurgy Assoc. 2016: 16.
3. CUPERUS JL, VENTER G, BLAINE DC. Finite element analysis of the tread quenching of railway wheels. 10th South African conference on Computational and Applied Mechanics, North West, South Africa, SA Assoc for Computational and Applied Mechanics (SACAM) 2016: 113.
4. "Influence of heat treatments on the microstructure and tensile behaviour of selective laser melting produced Ti6Al4V parts" by T.H Becker, D.C. Blaine, and G Ter Haar, 2016, South African Journal of Industrial Engineering 27(3) : 174-183.
5. "Process Models for Press-and-Sinter Titanium" by Deborah C. Blaine, Hendrik L. Bosman, Heleon H. Laubscher, AMI Light Metals Conference 2014, Pilanesburg, October 2014, *Advanced Materials Research, Vol. AMI Light Metals Conference 2014*, p.231-240
6. "Influence of Powder Particle Size Distribution on the Properties of Press-and-Sintered Titanium and Ti- 6Al-4V Preforms" by Hendrik L. Bosman, Deborah C. Blaine, AMI Light Metals Conference 2014, Pilanesburg, October 2014, *Advanced Materials Research, Vol. AMI Light Metals Conference 2014*, p.225-230
7. "Thermo-Gravimetric Analysis and Debinding Study of Powder Injection Moulded Titanium Alloy" by C.T.C. Crombie, Deborah C. Blaine, AMI Light Metals Conference 2014, Pilanesburg, October 2014, *Advanced Materials Research, Vol. AMI Light Metals Conference 2014*, p.210-217
8. "Sintering of electrophoretically deposited platinum nanoparticles" by D Blaine, A Ilchev, L Petrik, P Ndungu and A Nachaev, presented at *Sintering 2011*, September 2011, Jeju Island, Korea, published in *Advances in Sintering Science and Technology II: Ceramic Transactions, Volume 232, September 2012*
9. "Electrophoretic Deposition of PGM nanoalloys" by D Blaine, A Ilchev, L Petrik and P Ndungu, *Proceedings of the 2010 International Conference on Powder Metallurgy and Particulate Material, Powdermet 2010, Metal Powder Industries Federation, Princeton, NJ, 2010*, pp. 987-988
10. "Linearization of the Master Sintering Curve" by D. C. Blaine, S. J. Park and R. M. German, presented at *5th International Conference on Sintering 2008*, November 2008, San Diego, USA. Published in *Journal of American Ceramic Society, Vol. 92, No. 7, July 2009*, pp. 1403-1409
11. "Analysis of the Processing and Properties of Bulk Nanoscale Refractory Metals" by R. M. German, D.C. Blaine and E. Olevsky, *proceedings of the 16th International Plansee Seminar, Reutte, Austria, Vol. 1, 2005*
12. "Master Sintering Curve for a two-phase material", by D. C. Blaine, S. Park, R. M. German, *Proceedings of the 4th International Conference on Science, Technology and Applications of Sintering, Institut National Polytechnique de Grenoble, Grenoble, France, 2005*, pp. 264 - 267
13. "Modeling of fine molybdenum powder for press-and-sinter processing," by D. C. Blaine, P. Garg, R. M. German, *Proceedings of the 4th International Conference on Science, Technology and Applications of Sintering, Institut National Polytechnique de Grenoble, Grenoble, France, 2005*, pp. 268 - 271
14. "In situ characterization of apparent viscosity for continuum modelling of supersolidus liquid phase sintering", by D. Blaine, R. Bollina, and R. M. German, poster, *Proceedings of the 4th International Conference on Science, Technology and Applications of Sintering, Institut National Polytechnique de Grenoble, Grenoble, France, 2005*, pp. 307-310
15. "A Model for the Consolidation of Ultrafine Metal Powders," by R. M. German, D. Blaine, and E. Olevsky, *Proceedings of the 2005 International Conference on Powder Metallurgy and Particulate Materials, Metal Powder Industries Federation, Princeton, NJ, 2005*, pp. 1.100-1.109
16. "Computer Modeling of Distortion and Densification during Liquid Phase Sintering of High-Performance Materials," by D. C. Blaine, R. M. German, and S. J. Park, *Proceedings of the 2005 International Conference on Powder Metallurgy and Particulate Materials, Metal Powder Industries Federation, Princeton, NJ, 2005*, pp. 1.29-1.37.
17. "Verifying the Master Sintering Curve on an Industrial Furnace," by D. C. Blaine, S. J. Park, R. M. German, J. LaSalle, and H. Nandi, *Proceedings of the 2005 International Conference on Powder Metallurgy and Particulate Materials, Metal Powder Industries Federation, Princeton, NJ, 2005*, pp. 1.13-1.19.
18. "Distortion and Densification Control during Liquid Phase Sintering of High-Performance Materials" by R. M. German, S-H. Chung and D. Blaine, *NUMIFORM 2004, proceedings of 8th International Conference on Numerical Methods in Industrial Forming Processes, Columbus, OH, 13-17 June 2004*
19. "Production Cost Sensitivity Analysis for Metal Powder Injection Molding" by R.M. German and D. Blaine, *Proceedings of the 2004 International Conference on Powder Metallurgy and Particulate Materials, Metal Powder Industries Federation, Princeton, NJ, 2004*
20. "Sintering Shrinkage and Microstructural Evolution of a Martensitic Stainless Steel" by D. Blaine, Y. Wu, C. Schlaefel, B. Marx, and R.M. German, *Proceedings of the 3rd International Conference on Science, Technology and Applications of Sintering: SINTERING 2003, State College, PA, September 2003*
21. "New Developments in Continuum Modeling of Sintering" by D. Blaine and R.M. German, *Proceedings of the 3rd International Conference on Science, Technology and Applications of Sintering: SINTERING 2003, State College, PA, September 2003*

Conference presentations (non-peer reviewed, peer-reviewed abstracts)

- "Fabrication of carbon fibre reinforced MAXphase (Ti₂AlC) composite" by J. H. Nel, D. C. Blaine & I. Sigalas at *International Conference on Sintering 2017, San Diego, CA, November 2017*

- “Densification Pathways – Does the journey matter” by D. C. Blaine (invited) at *International Conference on Sintering 2017, San Diego, CA*, November 2017
- Learning through Teaching Practice, D Blaine, 10th Annual Stellenbosch University Conference on the Scholarship of Teaching and Learning, Somerset West, October 2017
- Microstructure and mechanical behaviour of sintered titanium foams, D. Blaine, W. van Zyl at *International Conference on Sintering 2014, Dresden, Germany*, August 2014
- Tailoring particle size distributions for improved properties of press-and-sintered titanium and Ti-6Al-4V, D. Blaine, H. Bosman at *International Conference on Sintering 2014, Dresden, Germany*, August 2014
- “The Machinability of PM Titanium” by D Blaine and K Sobiyi, presented at *Powdermet 2010*, June 2010, Fort Lauderdale, USA
- “Titanium Powder Metallurgy” by D. Blaine, presented at *IASSA 2009*, November 2009, Centurion, South Africa
- “Debinding by Wicking Large PIM Parts,” by D. C. Blaine, R. M. German, J. LeSalle, S. Das, and B. Sherman, *PIM2005, International Conference on the Powder Injection Molding of Metals, Ceramics, and Carbides, San Diego*, March 2005
- “PIM Simulation and Modeling” invited presentation at *Powder Injection Molding Introduction and Short Course, Orlando, FL*, March 2004
- “Master Sintering Curve Construction Software and its Application” by S.J. Park, S.H. Chung, D. Blaine, P. Suri, and R.M. German, *PIM2004, International Conference on the Powder Injection Molding of Metals, Ceramics, and Carbides, Orlando, FL*, March 2004
- “Large Metallic Parts by PIM” by D.Blaine, R.M. German, P. Suri, S. Das and J. LaSalle, *PIM2004, International Conference on the Powder Injection Molding of Metals, Ceramics, and Carbides, Orlando, FL*, March 2004
- “Evolution of PIM Sintering Models for Finite Element Size and Shape Prediction” by D.C. Blaine and R.M. German, *PIM2003, International Conference on the Powder Injection Molding of Metals, Ceramics, and Carbides, State College, PA*, March 2003
- “Simulation and Modeling for PIM” invited presenter at *PIM Tutorial, State College, PA*, October 2002
- “Sinter Simulation of PIM parts” presented at *CISP Industry Member Meeting, State College, PA*, October 2002
- “Sintering Simulation of PIM Stainless Steel” by D. Blaine and R.M. German, *Proceedings of the 2002 International Conference on Powder Metallurgy and Particulate Materials, Metal Powder Industries Federation, Princeton, NJ*, 2002
- “Sintering Simulation of PIM Stainless Steel” by D. Blaine and R.M. German, *PIM2002, International Conference on the Powder Injection Molding of Metals, Ceramics, and Carbides, San Diego, CA*, March 2002
- Axel Madsen/CPMT Scholarship Report – Debby Blaine, *International Journal Powder Metallurgy, Vol. 38, No. 6*, September 2002, pp. 38-39

Patents

- InnovUS – T659, Provisional Patent, Registration number ZA2008/09338, Filing date: 31 October 2008, Title: Artificial heart replacement valve, Inventors: C. Scheffer, H. Weich, A.N. Smuts, A. Esterhuyse, K. Van Aswegen, A. Groenwold, D.C. Blaine and K. Van Der Westhuizen

AWARDS AND SCHOLARSHIPS

- Stellenbosch University Rector's Award for General Performance, 2010, 2011, 2013, 2014
- Rhenish Girls' High School Distinguished Old Girl Achievement Award, 2009
- Penn State University Alumni Association Dissertation Award, 2003
- Axel Madsen Center for Powder Metallurgy Technology Scholarship, 2002
- South African Institute of Mechanical Engineers Campbell-Pitt Award for Outstanding Research Paper, 1999
- Foundation for Research and Development Scholarship, Stellenbosch University, 1997 & 1998
- 1st year Merit Bursary, Stellenbosch University, 1993

PROFESSIONAL ORGANISATIONS

- South African Society for Engineering Education (SASEE) – board member 2011-current; national general secretary 2011-15, president 2017 - current
- South African Institution of Mechanical Engineers (SAIMEchE) – committee member 2007-current, Western Cape Chairman 2011-13, Council member 2017 - current
- American Powder Metallurgy Institute (APMI) – student member, 2002-4; full member 2005-current
- European Powder Metallurgy Association (EPMA) – full member 2013-current
- Powder Metallurgy Association of South Africa (PMA) – committee member 2010-current