**DENNIS MICHAEL DIMIDUK, PH.D.**
Chief Technologist, BlueQuartz Software, LLC, Springboro, OH
Adjunct Professor, Department of Materials Science and Engineering, The Ohio State, University, Columbus, OH

## Education

| Degree | Year | Major Field | Institution |
|---|---|---|---|
| PhD | 1989 | Metallurgical Engineering and Materials Science | Carnegie Mellon University |
| MS | 1984 | Metallurgical Engineering and Materials Science | Carnegie Mellon University |
| BS | 1980 | Materials Science and Engineering | Wright State University |

## Employment History

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|---|---|
| Jun 1980 - Sep 86 | Materials Research Engineer, High Temperature Materials Branch, AF Wright Aeronautical Laboratories, WPAFB, OH |
| Sep 1986 - Jun 04 | Research Leader, High Temperature Materials/Advanced Metallics, Materials Development Branch, Wright Laboratory, WPAFB, OH |
| Aug 1993 - Aug 94 | Visiting Lecturer, Department of Materials; Visiting Scholar, Wolfson College, University of Oxford, Oxford, UK |
| Dec 1994 - Dec 01 | Adjunct Associate Professor, Wright State University, Dayton, OH |
| May 2002 - 2014 | Adjunct Professor, The Ohio State University, Columbus, OH |
| Jan 2004 - Sep 14 | Principal Materials Research Engineer, Materials & Manufacturing Directorate, Air Force Research Laboratory, WPAFB, OH |
| Feb 2009 - Jul 12 | Technical Director, Metals Ceramics & Nondestructive Evaluation Division, Air Force Research Laboratory, WPAFB, OH. |
| Nov 2014 – Present | Chief Technologist, BlueQuartz Software, LLC, Springboro, OH |
| Dec 2015 – Sep 2022 | Research Professor, Department of Materials Science and Engineering, The Ohio State University, Columbus, OH |
| Sep 2022 – Present | Adjunct Professor, Department of Materials Science and Engineering, The Ohio State University, Columbus, OH |

## Selected List of Honors and Awards

ASM Metals Scholar, 1978; Cum Laude graduate of WSU, 1980
AFOSR "Star Team" Award, for Excellence in Basic Research, inaugural year selection, 1990-1992, renewal selections, 1993-1995, 2000-2001, 2002-2003, 2004-2006
Outstanding Engineers and Scientists Award, Affiliate Societies Council, 1997
Fellow, ASM International, 1997
Fellow, Air Force Research Laboratory, 1998
John L. McLucas Air Force Basic Research Award, Honorable Mention, 2000, 2006
Elected Co-Chairman, 2004 & 2017 Physical Metallurgy Gordon Research Conferences
Charles J. Cleary Scientific Achievement Award, Air Force Research Laboratory, Materials and Manufacturing Directorate, winner, 2004
Alumni Achievement Award, Carnegie Mellon University, 2008
Top Cited Articles, Scripta Materialia 2007-2011; Acta Materialia, 2008 – 2013
Fellow, The Minerals, Metals and Materials Society, TMS, 2019

**Major Professional Activities and Association Memberships**

ASM International (1978–present); Fellows Council, (1997– ); Federal Affair Committee, (1998); International Materials Reviews Committee (1997–2000)
Materials Research Society (1984–present )
Multiscale Materials Modeling Conferences, International Advisory Committee (2006–present)
The Minerals, Metals & Materials Society (TMS) (early1980's–present); numerous roles/committees

**Professional Interests and Activities**

- High temperature materials development; superalloys, titanium alloys, refractory metals
- Gamma titanium aluminides (TiAl) technologies; processes and high-temperature properties
- Plasticity mechanisms, dislocations, multiscale modeling, constitutive equations
- Integrated multiscale materials and structures modeling and ICME
- 3-dimensional materials science; characterization methods, software, hierarchical data
- Micromechanical testing and materials size-scale effects
- Machine Learning and Artificial Intelligence for materials and Manufacturing

**Publication of Articles, Books, Patents, and Presentations**

- **>210 authored or co-authored publications**
- **Citations of published papers:** Dr. Dimiduk's publications have accrued over 19,500 citations and show an h-index of 63 and i10-index of 147 in Google Scholar.
- **Co-Edited 4 books and contributed 3 book chapters**
- **Dr. Dimiduk has delivered over 170 Invited, Keynote or Plenary presentations**, on a variety of research and engineering topics of materials. Additionally, Dr. Dimiduk contributed more than 230 additional presentations to colloquia, workshops and symposia held internationally on intermetallic materials, computational materials science and engineering, deformation mechanisms, strengthening, fracture, high-temperature materials, advanced structural materials processing and development, multi-scale materials modeling, integrated computational materials engineering, and machine learning and artificial intelligence (ML/AI) for materials engineering.
- **11 US Patents and 3 Invention Disclosures**
- **List of Representative Publications:**

1. "Progress in the Understanding of Gamma Titanium Aluminides," Y-W. Kim and D.M. Dimiduk, *JOM*, 43 (1991) pp. 40-47. (>880 citations)
2. "The Development of Nb-Based Advanced Intermetallic Alloys for Structural Applications," P.R. Subramanian, M.G. Mendiratta, and D.M. Dimiduk, *JOM*, 48 (1996) pp. 33-38. (>280 citations)
3. "The Role of Grain Size and Selected Microstructural Parameters in Strengthening Fully-Lamellar Ti-Al Alloys," D.M. Dimiduk, P.M. Hazzledine, T.A. Parthasarathy, S. Sriram and M.G. Mendiratta, *Met. Mater. Trans. A*, 29A (1998) pp. 37-47. (>140 citations)
4. "Gamma Titanium Aluminide Alloys—An Assessment Within the Competition of Aerospace Structural Materials," D.M. Dimiduk, *Mater. Sci. Engr. A*, A263, (1999) pp. 281-288. (Keynote Invited Paper, >690 citations)
5. "Mo-Si-B alloys—Developing A Revolutionary Turbine-Engine Material," D.M. Dimiduk and J.H. Perepezko, *MRS Bulletin*, 28, No. 9 (2003) pp. 639-645. (>310 citations)
6. "Sample Dimensions Influence Strength and Crystal Plasticity," M.D. Uchic, D.M. Dimiduk, J.N. Florando, W.D. Nix, *Science*, 305 (2004) pp. 986-989. (>2090 citations)
7. "Size-Affected Single-Slip Behavior of Pure Nickel Microcrystals," D.M. Dimiduk, M.D. Uchic and T.A. Parthasarathy, *Acta Mater.*, 53 (2005) pp. 4065-4077. (>660 citations)

8. "Scale-Free Intermittent Flow in Crystal Plasticity," D.M. Dimiduk, C. Woodward, R. LeSar and M.D. Uchic, *Science*, 312 (2006) pp. 1188-1190. (>530 citations)
9. "Contribution to Size Effect on Yield Strength from the Stochastics of Dislocation Source Lengths in Finite Samples," T.A. Parthasarathy, S.I. Rao, D.M. Dimiduk, M.D. Uchic and D. Trinkle, *Scripta Mater.,* 57 (2007) pp. 313-316. (>430 citations; "Top Cited Article 2007-20011")
10. "3D reconstruction and characterization of polycrystalline microstructures using a FIB–SEM system," MA Groeber, BK Haley, MD Uchic, DM Dimiduk, S Ghosh, *Materials Characterization* 57 (2006), 259-273. (>280 citations).
11. "A Framework for Automated Analysis and Simulation of 3D Polycrystalline Microstructures, Part 2: Synthetic Structure Generation," M. Groeber, S. Ghosh, M. D. Uchic and D.M. Dimiduk, *Acta Mater.*, 56 (2008) pp. 1274-1287. (>180 citations)
12. "Quasiperiodic Events in Crystal Plasticity and the Self-Organized Avalanche Oscillator," S. Papanikolaou, D.M. Dimiduk, W. Choi, J.P. Sethna, M.D. Uchic, C.F. Woodward, S. Zapperi, *Nature*, 490 (2012) pp. 517-522 (cover featured article, >130 citations)
13. "Crystal Plasticity FEM Simulations for a Polycrystalline Ni Micro Specimen Deformed in Tension," Y.S. Choi, M.A. Groeber, P.A. Shade, T.J. Turner, J.C. Schuren, D.M. Dimiduk, M.D. Uchic, A.D. Rollett, *Metall. Mater. Trans.,* 45 (2014) pp. 6352-6359.
14. "New Opportunities for Quantitative Tracking of Polycrystal Responses in Three Dimensions," J.C. Schuren, P.A. Shade, J.V. Bernier, S.F. Li, B. Blank, J. Lind, P. Kenesei, U. Lienert, R.M. Suter, T.J. Turner, D.M. Dimiduk, J. Almer, *Curr. Opin. in Sol. State and Mater. Sci.*, 19 (2015) pp. 235-244.
15. "Making the Case for a Model-Based Definition of Engineering Materials," D.U. Furrer, D.M. Dimiduk, J.D. Cotton, C.H. Ward, *Inter. Mater. Mfg. Innov.*, 6 (2017) pp. 249-263.
16. "Perspectives on the Impact of Machine Learning, Deep Learning, and Artificial Intelligence on Materials, Processes, and Structures Engineering, "D.M. Dimiduk, E.A. Holm, S.R. Niezgoda, *Inter. Mater. Mfg. Innov.,* 7 (2018) pp. 157-172.
17. "Statistically Equivalent Representative Volume Elements (SERVE) for Material Behaviour Analysis and Multiscale Modelling," S. Ghosh, D. Dimiduk, D. Furrer, *International Materials Reviews*, 68 (2023) pp. 1158-1191.

**Direction of Important Research or Engineering Work**

- Trained as metallurgist and practiced high-temperature alloy development from ~1980-2003.
- Advised or Co-Advised 14 Ph.D. and 3 M.S degree students from various universities; Hosted & mentored 38 Visiting Scientists and National Research Council Fellows
- Served on > 24 official Government Committees for domestic and international research
- Participates in various educational outreach and teaching
- Reviewer for more than 32 journals and agency studies
- Led a team of ~17 Ph.D.-level government employees, visiting scientists, and graduate students; with their support staff, and facilities from 1984 through 2004.
- From 2000 – 2004, was Air Force Senior Technical Advisor to DARPA-AIM programs for both metals and composites throughout their duration and selected follow-on efforts.
- From late 1999 through ~2009, led the Air Force Research Laboratory Accelerated Insertion of Materials program team. Contributing numerous key methods and discoveries. Most notably, development methodology for microcrystal and micropillar testing (widely used today). The methodology led to discovery of dislocation based "size effects" at the micrometer and nanometer scales, also proved existence of dislocation scale-free avalanches (highly sited papers in Science and Nature). Also, contributed to new methods for automated 3d-serial sectioning and characterization of materials. Conducted the first ever focus ion beam serial

sectioning and 3D reconstructions; led development of significantly improved synthetic microstructure builders, and worked to significantly enhance Robo-Met.3D technologies for optical serial sectioning.
- From 2004 – 2009, led and contributed to the foundational research that resulted in the present-day DREAM.3D software suite, an entirely new, open-source software tool for management, manipulation and analysis of 3D microstructure information and model building.
- Provided strategic advice to the Division and corporate level on all matters related to the science and technology capabilities for current and future structural materials.
- Led development of objectives, approaches and content for Division's programs, including structural materials basic science; metals, ceramic composite processing; probabilistic fatigue behavior of high-temperature nickel and titanium alloys; oxide-oxide and SiC-SiC ceramic matrix composites behavior; ultra-high temperature carbides and borides; functional ceramics; nondestructive evaluation including ultrasonic, eddy current, X-ray and other methods; characterization methods including electron-optical methods and high-energy X-ray techniques; broad aspects of integrated computational materials engineering (ICME).
- Provided technical and career mentoring to ~200 Air Force and contractor personnel.
- Served on the corporate-level Technology Review Board and Research Council.
- Co-PI on National Science Foundation grant to investigate use of generative adversarial networks (machine learning/artificial intelligence method) for microstructural science.

**Management Responsibility and Oversight of Materials Technology**

- Research Leader for Air Force High Temperature Materials team for nearly twenty years.
- Led and contributed to the Air Force Team, and was an identified primary international leader for development and transition of TiAl-based gamma-titanium aluminide alloys. Led research and established foundational sciences for titanium aluminides, including all aspects of processing-structure-property relationships and, patented several alloys and processes. The work resulted in the successful transition of the materials into aero engine certification and use, as well as automotive engine uses. Today, alloys are used in both General Electric and Pratt & Whitney engines and a slatted for numerous new engine designs.
- Led foundational developments for silicide-based and other refractory alloys and intermetallics under continued exploration for high-temperature structural applications.
- In the mid 1980's introduced computational materials science (CMS) methods into alloy development programs and was perhaps the first team to ever fully embed practitioners of theory, modeling and simulation within an experimentally based development team for synergistic technical returns.
- In 1995, together with Prof. Austin Chang, secured funding and launched "CompuTherm," a successful company for phase diagram computations and thermodynamic data.
- In 1996, introduced the first concepts of what is now "integrated computational materials engineering" (ICME) to DARPA; provided first-hand technical experience and guidance, through 1999 to fund and launch the "Accelerated Insertion of Materials" (AIM) programs.
- In 2009, was selected as the Technical Director of the Materials and Manufacturing Directorate's, Metals, Ceramics and NDE division. From 2009 - 2012, instituted laboratory-wide programs and personnel developments related to ICME, across all structural materials classes. Also, worked to introduce the concepts into the domain of functional materials.
- Beginning in 2010, offered significant written and verbal input to the White House Office of Science and Technology Policy (OSTP), "Fast Track Action Committee on Computational Modeling and Simulation," and continued to work through that committee to craft the consensus white paper that launched the "Materials Genome Initiative" (MGI).

- From October 2011 through May of 2012, led an enterprise-wide restructuring of all aspects of the Materials and Manufacturing Directorate in-house research at AFRL.
- In 2011, upon requests from OSTP, worked with TMS to develop and carry out the MGI Leader's Summit, held in Orlando FL in March of 2012. The Summit brought together numerous executive level leaders from Government and industry to discuss MGI goals and develop industrial commitments toward the initiative. These led to the "Orlando Principles."
- Led two joint TMS and ASM International, multi-Society gatherings for delineated goals and challenges for materials data, as a part of the MGI.
- In February 2013, was selected by the National Science and Technology Council, Sub-Committee for the Materials Genome Initiative, to lead a technical team to define Fundamental Grand Challenge goals for the MGI, as input to the MGI Strategic Plan.
- Continues to make invited keynote and plenary presentations pertaining to the MGI, its goals, and selected technical progress.
- Built strategy, stimulated funding and worked with businesses for 3D materials science, leading to start-up BlueQuartz Software. Advocated to Air Force for Open-Source decision.
- Continues to lead strategy and development related to 3D materials science and its connections to multiscale materials modeling and simulation, primarily through role as Chief Technologist for the startup company, BlueQuartz Software, LLC.
- Continues to develop machine learning and artificial intelligence methods for materials.

**Selected Professional Service**

- Co-Organized 2 TMS international symposia on *Gamma Titanium Aluminides*
- Co-Organized TMS specialty conference on *Structural Intermetallics*
- Co-Organized first symposium on *3D Materials Science* in 2002, now stand-alone conference.
- TMS *Programming Committee* 200 - 2004, served as SMD Representative
- Served as the TMS Representative to the *Joint Program Planning Committee for the MS&T'06* conference (2005-2006), preserving elements of 'bottom-up' programming at MS&T
- In 2005 - 2009 joined the *Integrated Computational Materials Engineering, Technical Advisory Group* (ICME-TAG). TAG resulted ongoing membership in the *ICME Committee*.
- *Vice Chairman of SMD,* 2008-2010. Served on Division and Society awards committees, the *Honors and Professional Recognition Committee*, the Technical Divisions Council
- *Chairman of SMD*, 2011 – 2013; one of the largest and technically diverse Divisions in TMS.
- Elected to the *TMS Board of Directors*, serving from 2011 - 2013
- Volunteered with the TMS strategic initiative centered on *Materials and Manufacturing Innovation* in 2012–2014, aided and led TMS leadership and a Summit of executive-level industry leaders in 2012; led to the *"Orlando Principles"* for guiding the MGI in industry
- *Led two inter-society meetings to elicit MGI goals*. Led MS&T'11 meeting of 13 engineering and professional associations for actions on MGI. Led TMS-ASM, MS&T'12 mtg. of 20 prof. associations; defined goals for materials digital data set scope for topic
- Co-Organized 2 Gordon Research Conferences, 2004 and 2017
- Editorial Boards
    - *Integrating Materials and Manufacturing Innovation*, TMS-Springer, (2011–present)
    - *Intermetallics*, Elsevier Science, Ltd. (1996–present)
    - *International Materials Reviews*, Institute of Materials, Minerals and Mining and ASM International, Maney Publishing, (1997- 2000)