Jian-Gang (Jimmy) Zhu, *IEEE Fellow*

ABB Professor of Engineering
Director, Data Storage Systems Center
Department of Electrical and Computer Engineering
Carnegie Mellon University
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Courtesy Appointments:
Professor, Department of Physics, Carnegie Mellon University
Professor, Department of Materials Science and Engineering, Carnegie Mellon University

Education:

Ph.D., *Physics* 03/89	University of California at San Diego
M.S., *Physics* 10/83	University of California at San Diego
B.S., *Physics* 01/82	Huazhong University of Science and Technology Wuhan, China

Professional Experiences

07/03 – present	*ABB Professor of Engineering*, Department of Electrical Engineering, College of Engineering, Carnegie Mellon University
04/05 – present	*Director*, Data Storage Systems Center, Carnegie Mellon University
01/99 – present	*Professor* Department of Electrical and Computer Engineering Carnegie Mellon University
01/97-12/98	*Associate Professor* Department of Electrical and Computer Engineering Carnegie Mellon University
06/94-01/97	*Associate Professor* Department of Electrical Engineering, University of Minnesota
09/90-06/94	*Assistant Professor* Department of Electrical Engineering, University of Minnesota
03/89-08/90	*Postdoctoral Research Fellow*, The Center for Magnetic Recording Research University of California, San Diego

09/87-11/87	*Visiting Researcher* IBM Almaden Research Center
07/86-09/86	*Visiting Senior Scientist* Magnetic Peripherals Inc., Control Data Corp., Minneapolis
01/82-09/82	*Instructor* Huazhong University of Science and Technology, China

Awards and Honors

2023	Benjamin Richard Teare Award for Teaching Excellence, College of Engineering
2021	Joel and Ruth Spira Excellence in Teaching Award
2012	Outstanding Teaching Award, Carnegie Mellon University
2011	IEEE Magnetic Society Achievement Award (Highest Award of the Magnetic Society)
2011	CIT Outstanding Research Award, Carnegie Mellon University
2008	Fellow, IEEE
2004	IEEE Distinguished Lecturer
2003	ABB Professor in Engineering, Carnegie Mellon University
2002	Senior Member, IEEE
1996	R&D Magazine Top 100 Inventions Award
1995	IBM Research Partnership Award
1993	NSF Presidential Young Investigator Award
1993	McKnight-Land Grant Professorship, University of Minnesota
1993	IBM Faculty Development Award
1993	3M Faculty Development Award
1991	NSF Research Initiation Award
1990	IBM Postdoctoral Fellowship Award

Technical Society Service:

Conference Local Chair, The Magnetic Recording Conference, 2024
Conference Local Chair, The Magnetic Recording Conference, 2021
Symposium on Advanced Spintronic Materials, Co-Organizer, MS&T Conference, 2014
Conference Co-Chair, TMRC 2012
Conference Co-Chair, MORIS 2009
Program Chair MORIS Conference, 2007
Local Chair, The Magnetic Recording Conference, 2006
Publication Chairman, The Magnetic Recording Conference, 2003.
Advisory Editor, Journal of Magnetism and Magnetic Materials, North-Holland, Elsevier 1998-present.
Chairperson (micromagnetics), IEEE Magnetics Society Technical Activities Committee, 1994-1998.
Served on the IEEE Magnetic Society Administrative Committee, 1997-1999.
Publication Chairman, The Magnetic Recording Conference, 1998.
Publication Co-Chairman, 41st Conf. on Magnetism and Magnetic Materials, 1996.
Publication Co-Chairman, 40th Conf. on Magnetism and Magnetic Materials, 1995.
Publication Chairman, The Magnetic Recording Conference, 1995.

Patents:

1. US Patent No. 5,859754 "Magnetoresistive transducer having a common magnetic bias using assertive and complementary signals."
2. US Patent No. 5,784,224, "Compact read/write head having biased GMR element"
3. US Patent No. 5,576,941 "Compact read/write head having biased GMR element"
4. US Patent No. 6,391, 483 "Magnetic Device and Method for Forming Same", 05/21/2002
5. US Patent No. 6,185,077 "Spin Valve Sensor with Antiferromagnetic and Magnetostatic Coupled Pinning Structure", 02/06/2001
6. US Patent No. 6,404,601 "Merged Write Head with Magnetically Isolated Poletip", 06/11/2002.
7. US Patent No. 6,392,850 "Magnetoresistive Transducer Having a Common Magnetic Bias Using Assertive and Complementary Signals" , 05/21/2002
8. US Patent No. 6,667,862 "Magnetoresistive Read Head Having Permanent Magnet On Top of Magnetoresistive Element", 12/23/2003
9. US Patent No. 6,807,033 "Magnetic sensor with reduced wing region sensitivity", 10/19/2004
10. US Patent No. 6,754,016 "Frequency modulation pattern for disk drive assembly", 06/22/2004
11. US Patent No. 6,877,116 "Method and Apparatus for determine bit error rate in a sampled data system without requiring read channel circuitry", 04/05/2005
12. US Patent No. 6,956.297 "Magnetic Memory Element and Memory Device Including Same," 10/18/2005
13. US Patent No. 7,616,412 "Perpendicular spin-torque-driven magnetic oscillator", 11/10/2009.
14. US Patent No. 7,826,258 "Crossbar Diode Switched MRAM Design," 12/2010
15. US Patent No. 8 ,211,557 "Binary Anisotropy Media," 07/2012
16. US Patent No. 8,400,066 "mLogic" 03/2013
17. US Patent No. 8,449,730 "Buffer Layers for L10 thin film perpendicular media," 05/28/2013
18. US Patent No. 8,476,925 "Magnetic Switching Cells," 07/02/2013
19. US Patent No. 9,117,523 "Chainlink Memory," 08/25/2015
20. US Patent No. 9,300,301 "Nonvolatile Magnetic Logic Device," 12/2016
21. US Patent No. 10,026,431 "Magnetic Shift Register," 07/2018
22. US Patent No. 10,090,007 "Dual-Side Spin Transfer Spin Torque Oscillator," 01/2016
23. US Patent No. 11,017,801 "Magnetic head with assisted magnetic recording and method of making thereof," 10/2018

Expert Witness in Legal Cases:

Expert Rebuttal Report, U.S. Tax Court, *Western Digital Corp. v. Commissioner of Internal Revenue*, Dkt. Nos. 18984-18, 4818-19

<u>INVITED</u> Papers at Major International Conferences: (111)

1. "Single Pass Three-Level Recording for Heat Assisted Magnetic Recording," The Magnetic Recording Conference 2025, Talk C5, Tohoku University, Sendai, Japan.

2. "Mechanism for High Track Density in Heat Assisted Magnetic Recording," The Magnetic Recording Conference, Talk B5, 2024, UC Berkeley.

3. "Scaling of Signal-to-Noise Ratio in Heat Assisted Magnetic Recording," The Magnetic Recording Conference, Talk A1, 2023, University of Minnesota.

4. "Efficiency enhanced microwave assisted magnetic recording," The Magnetic Recording Conference, Talk C4, 2022

5. "ASIC Implementation of Machine Learning Read Channel in 28nm CMOS for TDMR," The Magnetic Recording Conference, Talk A6, 2022

6. "TDMR Performance Gain with Machine Learning Data Detection Channel," The Magnetic Recording Conference, Talk D-4, 2021.

7. "Spin Torque Oscillator for Microwave Assisted Magnetic Recording," The Magnetic Recording Conference, Talk F-6, 2021.

8. "Incoherent Magnetic Switching in $L1_0$ FePt HAMR Media," Paper A5, The Magnetic Recording Conference, 2020.

9. "AI-Based Machine Learning for Data Detection in Hard Disk Drives," The Magnetic Recording Conference, Paper B6, Minneapolis, 2019.

10. "Understanding Recording Process in Microwave Assisted Magnetic Recording," The Magnetic Recording Conference, Paper C1, Minneapolis, 2019.

11. "Field-Free Spin Orbital Torque Switching of Perpendicular Magnetic Tunnel Junction", The Magnetic Recording Conference, Paper E3, Minneapolis, 2019.

12. "MAMR: Next Generation Magnetic Recording and Data Storage Technology," NIMS Academic Symposium, L03, Tokyo, Japan, Oct. 10, 2018.

13. "Novel Spin Torque Memory and Logic: Physics and Materials," 29th The Magnetic Recording Conference, Paper D01, San Jose, California, August 8-10, 2018.

14. "Resonant Spin Transfer Torque MRAM," International Magnetics Conference 2019, Paper HC01, Singapore, April 23-27, 2018.

15. "Meeting the Challenges in Heat-Assisted Magnetic Recording," MORIS 2018, January, 2018, Queens, New York (2018)

16. "Magnetic Head Design for Transition Curvature Correction in HAMR," The Magnetic Recording Conference, Tsukuba, Japan, August (2017).

17. "Controlling FePt Grain Size with a Granular MgO-C Interlayer for HAMR," The Magnetic Recording Conference, Tsukuba, Japan, August (2017).

18. "Physics, signal, and Noise in Heat-Assisted Magnetic Recording," META'16, the 7th International Conference on Metamaterials, Photonic Crystals and Plasmonics, Torremolinos, Spain (July 2016).

19. "Correcting Transition Curvature in Heat Assisted Magnetic Recording," The Magnetic Recording Conference, Stanford University, August, 2016.

20. "Two phase template growth for large scale nanostructure fabrication," World Innovation Conference and Expo, Washington, DC, May 2016.

21. "3D Stackable All Magnetic Memory Arrays," 2015 NVMTS, Beijing Oct. 2015.

22. "mLogic: All spin logic device and circuits for future electronics," Berkeley Symposium on Energy Efficient Electronic Systems (E3S), 2015.

23. "Spin Hall Effect Driven All Magnetic Nonvolatile Memory Arrays Based on Four-Terminal mCell Devices," Internag 2015, Paper GA-04, Beijing, May 2015.

24. "mLogic: All spin logic device and circuits for future electronics," American Physics Society March Meeting 2015, Session J19: Beyond CMOS, paper J19-02, March 7, 2015.

25. "Experimental Demonstration of Four-Terminal Magnetic Logic Device with Separate Read- and Write-Path**s,"** *International Electron Devices Meeting* (IEDM), Paper 33.1, 2014, San Francisco, USA, December, 2014.

26. "SNR Characteristics of Different Noise Origins in FePt-$L1_0$ Media," Paper B2, The Magnetic Recording Conference, Berkeley, California, August 11-13, 2014.

27. "Template Two Phase Growth of Magnetic Recording Media," Paper A1, The Magnetic Recording Conference, Berkeley, California, August 11-13, 2014.

28. "mLogic: All Spin Logic Device and Circuits for Future Electronics," International Magnetics Conference, Dresden, Germany, May 3-7, 2014.

29. "SNR and Area Density Gain of MAMR with Segmented Media," The Magnetic Recording Conference, Tokyo, Japan, August 20-22, 2013.

30. "SNR and Noise Mechanisms in Heat Assisted Magnetic Recording," The Magnetic Recording Conference, San Jose, California, August 20-22, 2012.

31. "Area Density Capability and SNR in HAMR," Asian Pacific Magnetic Recording Conference, Singapore, Oct. 31-Nov. 2, 2012.

32. "Giant magneto-thermal conductivity in magnetic multilayers," 2012 International Magnetics Conference (Intermag), Vancouver, Canada, May 7-11, 2012.

33. "mLogic: A Novel STT Device Design Enables All-Metallic Logic Circuits," 56 International Magnetism and Magnetic Materials Conference, Scottsdale, Arizona, U.S.A., Oct. 30-Nov. 3 , 2011.

34. "Spin Transfer Torque: Enabling Spin-Electronics at Nano-Dimensions," BIT's 1st Annual World Congress of Nano-Science and Technology, Dalian, China, Oct.23-26, 2011.

35. "MAMR with Segmented Media," The Magnetic Recording Conference, Minneapolis, Minnesota, August 29-31, 2011.

36. "Segmented Perpendicular Thin Film Media," International Conference on Materials for Advanced Technologies, Singapore, June 26-July 1, 2011.

37. "SNR Enhancement in Segmented Perpendicular Media," 2011 International Magnetics Conference, Taipei, Taiwan, April 16-30 (2011).

38. "Medium Noise Mechanism in Small Grain Size Perpendicular Thin Film Media ," Asian Pacific Data Storage Conference 2010, Nov. 25-27, Hualian, Taiwan (2010).

39. "Challenges and Promises in Fabrication of Bit Patterned Media," SPIE 2010, Sept. 16, Monterey, California (2010).

40. "Noise mechanisms in small grain size perpendicular thin film media," The Magnetic Recording Conference, Paper A3, August 16-18, San Diego, California (2010).

41. "Development o f FePt-SiOx L10 Thin Film Media for HAMR Application," The Magnetic Recording Conference, Paper F2, August 16-18, San Diego, California (2010).

42. "The nature and impact of intergranular exchange coupling in perpendicular thin film media," The Perpendicular Magnetic Recording Conference, Paper 17b3, May 17-19, Sendai, Japan (2010).

43. "Crossbar MRAM Design with Scalability and Low Operating Power," ISIF 2010. San Juan, Puerto Ricoh (2010).

44. "Mass Data Storage: Battle Ground between SSD and HDD," Keynote Speech, Nonvolatile Memory Technology Symposium (NVMTS) 2009, Oct. 26-28, Portland, Oregon. (2009).

45. "MAMR Using PSTO with Switchable Magnetic Electrodes," The Magnetic Recording Conference (TMRC) 2009, Paper C5, Oct. 5-7, Tuscaloosa, Alabama (2009).

46. "Low Temperature HAMR and Crossbar MRAM Designs," 2nd Photonics and OptoElectronics Meeting (POEM), Invited Paper, August 8-10, Wuhan, China (2009).

47. "Chirality Switchable STT Oscillator for MAMR," MORIS 2009, June 21-23, Awaji, Japan.(2009).

48. "TDMR Platform Simulations and Experiments," 2009 International Conference on Magnetics, May 4-8, Sacramento, CA. (2009).

49. "Binary Anisotropy Structure for HAMR and MRAM Applications," Asian Magnetics Conference, December 10 – 14, 2008, Pusan, Korea.

50. "New Heights in Magnetic Data Storage," ISOS, Nov. 23-25., 2008, Wuhan, China.

51. "MAMR with circular AC Field," The 53rd Annual International Conference on Magnetism and Magnetic Materials, Nov. 14-17, 2008, Austin, TX, U.S.A.

52. "Grain Topography and Impact of Surface Anisotropy in Perpendicular Thin Film Media," The Magnetic Recording Conference, July 28-30, 2008. Singapore.

53. "Microwave Assisted Magnetic Recording," Perpendicular Magnetic Recording Conference, October 15-17, 2007, Tokyo, Japan.

54. "Binary Anisotropy Media," Annual International Conference on Magnetism and Magnetic Materials, November 5-8, 2007, Tampa, FL, U.S.A.

55. "Microwave Assisted Magnetic Recording," MORIS 2007, Paper F5, Sept. 24-26, Pittsburgh, PA (2007).

56. "Microwave Assisted Magnetic Recording," 18th The Magnetic Recording Conference, May 20-22, 2007, Minneapolis, MN, U.S.A.
57. **"**Study of Lithographically Defined Data Track and Servo Patterns," The Magnetic Recording Conference, May 20-22, 2007, Minneapolis, MN, U.S.A.
58. "Perpendicular Spin Torque Oscillator and its Applications," MRS Spring Meeting, Symposium on Nanoscale magnetics and Devices Applications (J), April 10-13, 2007, San Francisco.
59. "Micromagnetic Analysis of Percolated Perpendicular Media," 17th The Magnetic Recording Conference, August 7th – 9th, 2006, Pittsburgh, U.S.A.
60. "High moment materials and fabrication processes for shielded perpendicular write head beyond 200 Gb/in^2," The Magnetic Recording Conference, August 7th – 9th, 2006, Pittsburgh, U.S.A.
61. "Return Field-Induced Partial Erasure in Perpendicular Recording Using Trailing-Edge Shielded Writers," The Magnetic Recording Conference, August 7th – 9th, 2006, Pittsburgh, U.S.A.
62. "Fabrication, microstructure, magnetic, and recording properties of percolated perpendicular media," The Magnetic Recording Conference, August 7th – 9th, 2006, Pittsburgh, U.S.A.
63. "Overwrite Mechanism in Perpendicular Recording," 6th International Symposium on Physics of Magnetic Materials," September 13th – 16th, 2005, Singapore.
64. "On the Scalability of MRAM," MORIS 2006, June 6th – 8th, 2006, Chiba, Japan.
65. "Sub-coercivity Perpendicular Recording," Asian Pacific Data Storage Conference, August 28th, 2006, Hsinchu, Taiwan.
66. "Overwrite Mechanism in Perpendicular Recording," *The Magnetic Recording Conference*, August 14-18, 2005, Stanford, California.
67. "Spin Transfer Excited Microwaves in CPP Spin Valves," *SPIE Noise and Fluctuations Conference*, May 24, 2005, Austin, TX, U.S.A.
68. "Toward an Understanding of Grain-to-Grain Anisotropy Field Variation in Thin Film Media," The Magnetic Recording Conference, August 10, 2004. Bolder, Colorado.
69. "Current induced noise in CPP spin valves," *SPIE Noise and Fluctuations Conference*, May 26, 2004, Grand Canary, Spain.
70. "Magnetic Random Access Memory: The Path to Competitiveness," 9th International Conference on Ferrites. August 23, 2004, San Francisco.
71. "Current Induced Magnetic Noise in CPP Spin Valves," *The Magnetic Recording Conference*, August 18-20, 2003, Santa Clara, California.
72. "The Role of SUL in Readback and Linear Density Limitation Imposed*," 6th Perpendicular Magnetic Recording Conference*, January 6-8, 2003, Monterey, California.
73. "Novel MRAM Design for High Area Densities," *American Physics Society Meeting*, March 14, 2002, Indianapolis, Indiana.
74. "MRAM Design Limitations Dictated By Thermally Activated Magnetization Reversal," *Nonvolatile Memory Technology Conference*, November 5th, 2002, Honolulu, Hawaii.
75. "Dynamic Micromagnetic Analysis of Single Pole Perpendicular Recording Heads," *North American Perpendicular Recording Conference*, January 7th, 2002, Miami, Florida.

76. "MRAM Design Dictated by Thermally Activated Magnetization Reversal," *The 46th Annual Conference on Magnetism and Magnetic Materials,* November 12, Seattle, Washington.

77. "Spin Dynamics and Thermal Activation in Small Thin Film Structures," *Material Research Society Annual Conference*, November 24, 2001, Boston, Massachusetts.

78. "A New GMR Head Design For Ultra-High Linear Density Recording," *The Magnetic Recording Conference*, August 20, 2001, Minneapolis, Minnesota.

79. "Understanding Single Turn Head Design at Narrow Track Widths," *The Magnetic Recording Conference*, August 20, 2001, Minneapolis, Minnesota.

80. "Design of Ultra-High Density Vertical Magnetoresistive RAM," *The 44th International Conference on Electron, Ion and Photon Beam Technology and Nanofabrication,* May 30-June 2, 2000, Rancho Mirage, California.

81. "Vertical Magnetoresistive Random Access Memory," *Symposium on Magnetic Materials for Magnetoelectronic Devices*, May 17-18, 2000, Ames, Iowa.

82. "Micromagnetic Modeling of Thin Magnetic Films and Device Applications," *NATO Summer School on Magnetic Storage Systems Beyond 2000*, June 12-23, 2000, Rhodes, Greece.

83. "Ultra-High Density Vertical Magnetoresistive Random Access Memory (VMRAM)," Invited paper at *The 44th Annual Conference on Magnetism and Magnetic Materials,* November 1999, San Jose, California.

84. "Recording, Noise, and Servo Characteristics of Patterned Thin Film Media," Invited paper at *The Magnetic Recording Conference 1999*, San Diego, California.

85. "Understanding Micromagnetics of Patterned Magnetic Devices," Invited paper at *American Physics Society Conference,* March, 1999, Atlanta, Georgia.

86. "Dynamic Magnetic Switching in Patterned Thin Film Elements," Invited paper at *The 43rd Annual Conference on Magnetism and Magnetic Materials,* November 1998, Miami, Florida.

87. "Spin Valve and Dual Spin Valve Heads with Synthetic Antiferromagnets," Invited paper at *The Magnetic Recording Conference,* August, 1998, Boulder, Colorado.

88. "Micromagnetics of Magneto-Electronic Devices," Invited paper at *The Magnetic Multilayers Conference,* June, 1998, Vancouver, Canada.

89. "Micromagnetic Behavior in GMR Multilayers Devices," with Y. Zheng, Invited paper at *The Materials Research Society 1997 Fall Meeting*, December 1-5, 1997, Boston, Massachusetts.

90. "Micromagnetics of Patterned Magnetic Thin Film Elements," with Y. Zheng, Invited paper at *The 44th National AVS Symposium*, October 20-24, 1997, San Jose, California.

91. "Directly Identifying the Order of Layer Switching in Magnetic Multilayers," with J. W. Freeland, *et al*, Invited paper at *The 44th National AVS Symposium*, October 20-24, 1997, San Jose, California.

92. "Nonlinear Behavior of Magnetoresistive Heads," with Thomas C. Arnoldussen, Invited paper *at The Magnetic Recording Conference (TMRC)*, September 1997, San Jose, California.

93. "Noise Properties in oriented longitudinal film media for MR heads applications," with H. Fang, Invited paper at *The 2nd Thin Film Media Symposium*, December 1997, San Jose, California.

94. "Characteristics of Narrow Track Recording in Thin Film Recording Media," Invited paper at *The Magnetic Recording Conference*, August 1996, Santa Clara, California.

95. "Micromagnetics of small size patterned exchange biased Permalloy film elements," with Y. Zheng and X. Lin, Invited paper at *The Magnetic Material and Magnetism Conference*, November 1996, Atlanta, Georgia.
96. "Impact of Microstructure on Stability of Permanent Magnet Biased Magnetoresistive Heads," Invited paper at *The Magnetic Recording Conference*, July 1995, Pittsburgh, Pennsylvania.
97. "Effect of Microstructure and Crystalline Orientation In Longitudinal Thin Film Media," Invited paper at *The 1995 International Magnetics Conference*, April 1995, San Antonio, Texas.
98. "Modeling of Magnetic Thin Films," Invited paper at *The American Physics Society Annual Meeting*, March 1995, San Jose, California.
99. "Noise Characteristics of Interacting Transitions in Longitudinal Thin Film Media," Invited paper at *The Magnetic Recording Conference*, August 1994, San Diego, California.
100. "Advanced Tape Media for Ultra-High Density Recording," Invited paper at *The Perpendicular Recording Conference* '94, October 1994, Tokyo, Japan.
101. "Fabrication and Recording Performance of Bicrystal Disks on GaAs Substrates," Invited paper at *The Perpendicular Recording Conference* '94, October 1994, Tokyo, Japan.
102. "Advanced Microstructures of Thin Film Media For Ultra-High Area Recording Densities," Invited paper at *The 3rd IUMRS International Conference on Advanced Materials*, August 1993, Tokyo, Japan.
103. "Micromagnetic Study of Barkhausen Jumps in Small Magnetoresistive Sensors," Invited paper at *The International Magnetics Conference '93*, April 1993, Stockholm, Sweden.
104. "Computed Hysteresis Behavior and Interaction Effects in Spheroid Particle Assemblies," Invited paper at *The International Magnetics Conference '93*, April 1993, Stockholm, Sweden.
105. "Effect of Easy Axis Orientation and Noise in Thin Film Media," Invited paper at *The International Symposium on Barium Ferrite Recording Media*, September 1992, Greece.
106. "Transition Noise in Oriented Thin Film Media," Invited paper at *The Magnetic Recording Media Conference*, September 1992, Italy.
107. "Transition Noise in Longitudinal Thin Film Media", Invited paper at *The Magnetic Recording Conference*, July 1992, Santa Clara, California.
108. "Effect of In-plane Easy Axis Orientation in Narrow Track Recording", Invited paper at *The Magnetic Recording Conference*, July 1992, Santa Clara, California.
109. "Nonlinearity in Thin Film Media", Invited paper at *The Magnetic Recording Conference*, July 1992, Santa Clara, California.
110. "Magnetization Reversal Mechanisms and Domain Structures in Magnetic Thin Films", Invited paper in *The 35th Annual Conference on Magnetism and Magnetic Materials*, November 1990, San Diego, California.
111. "Micromagnetic Studies of Thin Metallic Films", Invited paper in *The 33th Annual Conference* on Magnetism and Magnetic Materials, November 1988, Chicago, Illinois.

Publications:

Book Chapters (10):

1. *M. Moneck and J.-G. Zhu*, “Fabrication of Bit Patterned Media,” Fundamentals of Magnetism, p. 1-49, Edited by PMEI Allia, G Barrera (2016).
2. E *Gage, KZ Gao, J-G Zhu*, “Energy Assisted Magnetic Recording,” Ultra-High-Density Magnetic Recording: Storage Materials and Media Designs. (2016)
3. *Jian-Gang (Jimmy) Zhu,* "Perpendicular Spin Torque Oscillator and Microwave Assisted Magnetic Recording," *Metallic Spintronic Devices,*Editor: Xiaobin Wang, CRC, pp. 1 (2014).
4. *Jian-Gang (Jimmy) Zhu*, "Magnetization Dynamics: Thermally-driven Noise in Magnetoresistive Sensors," *Handbook of Magnetism and Advanced Magnetic Materials,*Editors-in-Chief: Helmut Kronmuller and Stuart Parkin, Wiley*,* vol.2, pp. 1083-1091 (2007).
5. *J.-G. Zhu*, “Magnetization Reversal Dynamics,” Encyclopedia, Edited by J. Buschow, Elsevier, 2004.
6. *J.-G. Zhu* and Y. Zheng, “Micromagnetics of Magnetoresistive Random Access Memory,” *Spin Dynamics in confined Magnetic Structures I.* Edited by B. Hilebrands and K. Ounadjela, Springer, p. 289-325 (2001).
7. *J.G. Zhu*, “Micromagnetic Modeling of Domain Structures in Magnetic Thin Films,” Magnetic Imaging And It’s Applications to Materials, Chapter 1, V. 36, Edited by Marc de Graf and Yimei Zhu, Academic Press (2001).
8. *J.-G. Zhu*, "Micromagnetics of Thin Film Media", *Magnetic Recording Technology* (Chapter 5) Edited by C.D. Mee and E. Daniel, McGraw Hill (Dec. 1995).
9. H.N. Bertram and *J.-G. Zhu*, "Fundamental Magnetization Processes in Thin Film Recording Media", *Solid State Physics*, Edited by H. Ehrenreich and D. Turnbull, vol.46, pp.271-371, *Academic Press* (1992).
10. *J.-G. Zhu* , "Micromagnetic Modeling of Thin Film Recording Media", *Noise in Digital Magnetic Recording,* Edited by T.C. Arnoldussen and L. Nunnelley, Chapter 6, *World Scientific* (1992).

General Review Articles in Magazines:

1. *Jian-Gang Zhu* and Chando Park, “Magnetic Tunnel Junctions,” Materials Today, vol. 9, No. 11, p. 36-45, November , 2006.
2. R. Ditizio, P. Werbaneth, and *J.-G. Zhu*, “Cell Shape and Patterning Considerations for Magnetic Random Access Memory (MRAM) Fabrication,” *Semiconductor Manufacturing*, Vol. 5, Issue 1, January 2004, p. 90.
3. *J.-G. Zhu*, “New Heights for Disk Drives,” Cover story in *Materials Today*, July/August issue, 2003, p.22-31.
4. *J.-G. Zhu* and G.A. Prinz, “VMRAM memory holds both promise and challenges,” *Data Storage*, September 2000, p.40-45.

Refereed Major Journal Publications: (total: 343)

1. C. Xu, E. Zhang, B.Y. Yang, BSDCS Varaprasad, DE Laughlin, J.-G. Zhu, "Thermal Conductance Analysis of the FePt/hBN/FePt Interface," IEEE Trans. Magn., (2024)
2. J.-G. Zhu, P.O. Jubert, A. Moser, R. Brokie, R Shi,"Understand High Track Density in Heat Assisted Magnetic Recording," IEEE Trans. Magn. (2024)
3. A. Shadman and J.-G. Zhu, "Excitation and Dynamics of Spin Solitons in Chiral Magnetization Configuration," Applied Physics Letters, 124 (17) (2024).
4. J.-G. Zhu, "The Scaling of Signal-to-Noise in Heat Assisted Magnetic Recording," IEEE Transactions on Magnetics, (2023)
5. C. Xu, BSDCS Varaprasad, DE Laughlin, and J.-G. Zhu, "Fabrication of 16nm thick granula L10 FePt-hBN thin film media," IEEE Transactions on Magnetics, (2023)
6. BSDCS Varaprasad, C. Xu, MH Huang, DE Lauglin, J.-G. (Jimmy) Zhu, "FePt-BN granular HAMR media with high grain aspect ratio and high L10 ordering on Corning Lotus^{TM} NXT glass," AIP Advances 13(3), 035002.(2023).
7. C. Xu, BSDCS Varaprasad, E.E. Laughlin, and J.-G. Zhu, "Bias sputtering of granular L10-FePt films with hexagonal boron nitride grain boundaries," Scientific Reports 13, 13438 (2023)
8. T. Du, D.E. Laughlin, J.A. Bain, W. Zhang, and J.-G. (Jimmy) Zhu, "Plasmonic near field transducer of nanocomposite with distributed feedback," AIP Advances 13 (2), 025004.
9. J.-G. Zhu, K. Zhang, L. Shimizu,"SNR impact of magnetic capping layer in granular FePt-L10 media," IEEE Transactions on Magnetics, (2023).
10. Y. Qin, R. Purdy, A. Probst, C-y Lin, and J.-G. Zhu, "Nonlinear CNN-Based Read Channel for Hard Disk Drive With 30% Error Rate Reduction and Sequential 200-Mbits/s Throughput in 28-nm CMOS," IEEE J. of Solid State Circuit (JSSC) (2023).
11. A. Shadman, J.-G. Zhu, "Micromagnetic insights on in-plane magnetization rotation and propagation of magnetization waves in nanowires," Scientific Reports, 13, 13438 (2023).
12. Y. Qin, R. Purdy, A. Probst, C-Y Lin, and J.-G. Zhu, "Nonlinear CNN-based Read Channel for Hard Disk Drive with 30% Error Rate Reduction and Sequential 200Mbits/second Throughput in 28nm CMOS," 2022 IEEE Symposium on VLSI Technology and Circuits (VLSI Technology and Circuits) 206-207, 2022.
13. C. Xu. B. Zhou, T. Du, B. Varaprasad, D.E. Laughlin, and J.-G. Zhu, "Understanding the growth of high-aspect-ratio grains in granular L10-FePt thin-film magnetic media," APL Materials, 10, 051105 (2022).
14. Y. Qin, P. Bellam, R. Galbraith, W. Hanson, N. Ravindran, I. Oboukhov, J.-G. Zhu, "CNN-Based Machine Learning Channel on TDMR Drive Data," IEEE Trans. Magn. Vol. 58. No. 4, 3010407 (2022)
15. Y. Qin and J. -G. Zhu, "TDMR with Machine Learning Data Detection Channel," in IEEE Transactions on Magnetics, doi: 10.1109/TMAG.2021.3088069.
16. T. Du, B. Varaprasad, Z. Guo, A.J. Gellman, J.-G. Zhu, D.E. Laughlin, "TEM-based study of oxidation of FeCo high moment alloy at elevated temperatures," J. of Magnetism and Magnetic Materials, 539, 168347, (2021).

17. B. Zhou, B. Varaprasad, C. Xu, M.-H. Huang, D.E. Laughlin, and J.-G. Zhu, “Fabrication of FePt/FePt-BN/FePtSiOx Granular Film for HAMR Media on Corning Lotus NXT Glass Substrate,” IEEE Trans. Magn. (2021).

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