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DAVID N. LAMBETH

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Education:

Ph.D. Physics, (b) (6) [redacted]
Massachusetts Institute of Technology

BS Electrical Engineering, (b) (6) [redacted]
University of Missouri, Columbia, MO

Noteworthy Honors and Awards:

Honorable Mention for the International IEEE-Eta Kappa Nu's 2011 C. Holmes MacDonald Outstanding Electrical and Computer Engineering Teacher Award, March 2012

Eta Kappa Nu "Excellence in Teaching Award," Carnegie Mellon University, June 2011

"Carnegie Institute of Technology Outstanding Research Award," Carnegie Mellon University, February 2005

Employment History:

Carnegie Mellon University, Pittsburgh, Pennsylvania, Professor of Electrical and Computer Engineering, Professor of Materials Science and Engineering: 3/1989 to present.

Supervised and conducted research efforts in instrumentation; sensor materials, devices and systems; optical and magnetic materials, devices and recording systems as well as a number of diverse product development programs.

Representative programs:

Conducting the development of a generalized analytical solution and study of conductive ellipsoidal field emitters. Field emitters are commonly used in field emission displays where models are needed to predict emitter wear. They are also used in electron microscopy where understanding the effects limiting spot size is all important.

P.I. for an AFOSR sponsored multi-disciplined program to develop single chip Integrated multi-modal nano-sensors. The central focus of this program is on the integration of multi-modal sensors with and emphasis on the development of chemical and biological sensing devices by micro-electro-mechanical and electronic (organic field effect transistor) sensing: 7/2002 to 1/2008. This program was continued under new AFOSR funding until 7/2009 to develop sensors for a safer America.

Co P.I. for a NSF NIRT sponsored program to develop new nano phases of carbon and to explore potential resulting electronic devices: 8/2003 to present.

Co P.I. for a CDC/NIOSH sponsored program to develop new vapor phase chemical sensors to determine the end-of-lifetime for gas mask cartridges: 8/2002 to present.

Co P.I. for a DOE/NETL sponsored program to develop new multi-element, high temperature, in-situ sensors for natural gas composition analysis: 6/19/2006 to present.

Co P.I. for the development of high-performance, high-temperature amorphous and nano-magnetic materials. Applications include high frequency transformers, inductors and D.C. to D.C. power converters.

Co-researcher for various private industrial research and development programs.

Past noteworthy activities and accomplishments include:

Associate Director Data Storage Systems Center (DSSC): 3/1989 to 8/1999.

Responsibility for the DSSC (a National Science Foundation Engineering Research Center) Optical Data Storage Program (7 yrs), the Hard Disk Media Group (10 yrs) and the Hard Disk Storage Program (3 yrs). Inventor of a hard disk media structure used in many desktop desk drives and most mobile computer disk drives.

National Storage Industrial Consortium (NSIC) Ultra High Density Hard Disk Media Program Group Leader coordinating the efforts of several universities and a few industrial participants.

Management of the development of a compact, high speed, Magneto-Optic Spatial Light Modulator Device (MOSLM) for Litton Data Systems and transferred design and production processes to Litton manufacturing. This program ran concurrently with the DSSC and NSIC programs. The technical objective for this system was to automatically recognize objects, such as handwriting, by performing high-speed (several kilo-frames per second) optical correlation signal processing. The MOSLM device required high-resolution optical lithography over large topological features.

Developed, with the Sensormatic Electronic Corporation, a new generation of Electronic Article Surveillance (EAS) magnetically shielded antenna systems. These systems are used to prevent retail theft. This effort required detailed systems analysis of both digital and analog signal processing in conjunction with materials performance and device design. It involved coordination of efforts both at CMU and at Sensormatic. The work resulted in both an improvement in detection sensitivity (improved SNR) and reduced cost of production.

The initial CMU Program Coordinator and Co-Principle Investigator of the NSIC/SWAT program (Short Wavelength Advanced Technology). This program was aimed toward developing integrated optical components for compact, lightweight, blue wavelength optical recording heads and waveguide beam deflectors. Integrated optical components developed included waveguided beam deflectors, passive and active lens assemblies and prisms, domain gratings for second harmonic blue light generation as well as fundamental materials studies.

Principal Investigator of DOD contract to explore the deposition of thin film magnetic oxides via laser ablation techniques.

Co-Principle Investigator of DOE contracts to determine the relationships between microstructure and magnetic properties for metallic thin films.

Lambeth Systems, Design and Consulting: 1988 to present. Principle activities have been to provide technical consulting, as well as to privately develop technology including new magnetic materials, thin film material structures, sensor devices and electronic circuits.

> A new amorphous metal oxide initial seedlayer structure for hard disk magnetic media was developed and is now employed in high volume manufactured products. This layer has enable the extension of areal densities of laptop hard disk drive media, employing glass substrates and B2 underlayers, to over 40 Gbit/in^2.
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> The second invention is a totally new thin film soft magnetic material structure enabling uni-axial magnetic properties from high moment BCC and BCC derivative materials such as iron, iron-cobalt and similar alloys. This unique structure enables the use of high moment materials with uniaxial magnetic properties for the performance improvement of a variety of magnetic devices and specifically holds promise for improvements in magnetic sensors, miniaturized radio frequency inductors and transformers for the telecommunications, MRAM, magnetic recording transducers, and perpendicular magnetic media. U.S., Japanese, Singapore and Korean patents have been awarded while (b)(4) [redacted].

Since this time there have been number of other inventions which are currently being pursued (see patent listing).

Dynamics Inc, Pittsburgh, PA, member of the Technical & Internal Strategy Advisory Board: Dynamics Inc. dedicated to the development and manufacture of electronic credit cards: 2007 to present. Inventor on several filed patent applications.

Intevac, Santa Clara, CA, Member of the Board of Directors: Intevac is the premier manufacturer of production vacuum equipment for hard disk media manufacturing and is entering the high performance infrared imagining arena: 1996 to 2006.

Control Data Corporation, Data Storage Products Division (now Seagate Magnetics) Minneapolis, Minnesota, Second Level Manager in Research and Advanced Technology: 1988.

> Management responsibility for advanced hard disk media and head disk interface technology and coordination of the technology transfer to production and development. Supervision of several university grant programs. Managerial and technical efforts resulted in the development and first commercial introduction of the popular CoCrTa alloy media and the invention of the laser texturing process. The patented laser textured media was used world wide in almost all desktop computer hard disk drives.

Eastman Kodak Company Research Laboratories, Rochester, New York: 1973 to 1988, Final position: Second Level Manager with the title of Magnetic Materials Laboratory Head.

> Management responsibility for approximately (b)(4) [redacted] Ph.D. professionals and (b)(4) [redacted] technicians for the development of particulate and thin film magnetic tape media and a permanent magnet, NdFeB, manufacturing process. Technical projects included the development of new metallic and barium ferrite particles for magnetic tape; magnetic particulate tape/disk formulation, coating technology, and testing; metal Co-Cr co-evaporated tape, and the development of hot pressing, to net shape, of oriented NdFeB permanent magnets. Responsibility for an annual budget of approximately (b)(4) [redacted].
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> Developed a very detailed business case for the manufacturing of permanent magnets utilizing modified proprietary Kodak hot forming facilities. This manufacturing opportunity arose due to personal efforts and interactions with the General Motors Magnequench Division.

As technical leader, manager, and inter-company coordinator, coordinated the development of an opto-electronic CCD/CMOS autofocus system for photographic cameras. This program crossed several company departments and divisions. The program lead to the development of new electronic range finder technologies for film based cameras, which would provide the technical ability to truly span the majority of the photographic image space. An inexpensive, high performance, light emitting (active), non-mechanical (static), triangulation autofocus system was developed based upon a fully integrated, single chip, CMOS compatible charge coupled detector device (CCD). This device incorporated all digital timing and switching for the CCD; analog, digital and optical signal processing and camera interface to provide object distance. Several of the concepts and circuit designs resulted in patents. A major accomplishment was that the device operated from a single 9-volt battery. This program provided the technical vehicle upon which the Company's proficiency in CMOS-CCD areas were developed.

Additional management assignments as well as senior research scientific assignments were in such diverse topics as electronic camera systems, sensors and actuator transducers, a novel photoconductivity based medical radiographic imaging system, write once and erasable optical data storage media and systems, and magnetic tape recording systems. These assignments resulted in several patents and internal papers.

Noteworthy is the invention in (b)(4) [redacted]

Hendrix Electronics, Londonderry, New Hampshire: 1970 to 1973: Summer and part-time.

While in a theoretical physics graduate school program at MIT, worked part time and summers on the more practical. Hendrix focused on developing text-processing equipment, prior to readily available personal computers, for the newspaper industry. Designed multiple voltage analog power supplies and a modem communication interface.

Representative Professional Activities:

IEEE	-	Electron Device Society and Magnetics Society member, Elected IEEE Fellow January 1, 1999: "For scientific, educational and professional contributions in the fields of magnetism, data storage systems, and electronic devices."
AIP	-	American Physical Society member.
IEEE-MAG	-	Magnetics Society Administrative Committee member: 1992-1998, 1999-2002, 2002-2006
	-	One of three editors for the Intermag Conference Proceedings: 1989 and 1990
	-	Chief Editor of the Intermag Conference Proceedings 1991.
IEEE-Sensors	-	IEEE Sensor Council member: 1999 to 2002.
	-	Editorial Board member of the IEEE Sensors Journal: 2001-present
AIP-MMM	-	Administrative Committee-Conference on Magnetism and Magnetic Materials: member for several years and Secretary 1995-96 and 1996-97.
	-	1993 MMM Conference Program Committee Co-chairman.

Magnetism Conference(s): Numerous activities and assignments.

TEPRSSC - Committee member: Technical Electronic Product Radiation Safety Standards Committee, Department of Health and Human Services, Food and Drug Administration: 2000 to Nov 2003.

Example Presentations:

"Single Chip, Multi-Modal, Integrated NanoSensors: Program Review", Air Force Office of Sponsored Research Review, Purdue University, May 23, 2007, West Lafayette, IN, 47904.

"Nano-Enabled Integrated Sensor Technology," Commercialization of NanoMaterials, PA 2006, Sept. 19, 2006, Pittsburgh, PA

"Single Chip Multimodal Integrated Nanosensors: Systems and Electronics", 2004 Nano Materials for Defense Applications Symposium, Maui, Hawaii, February 27, 2004.

"Magnetic Recording: How Extendable Is It?" Moderator, Joint MMM – InterMag Conf. Anaheim CA, January 1, 2004

"Single Chip, Multi-Modal, Integrated NanoSensors Program Introduction & Overview," Invited Presentation, National Institute for Occupational Safety and Health (NIOSH/CDC) Bruceton Research Center, November 14, 2003, McKeesport, PA

"Single Chip, Multi-Modal, Integrated NanoSensors," Invited Presentation, Air Force Office of Sponsored Research Reviews, July 31, 2003, University of Santa Barbara, CA

"Reinventing Magnetic Data Storage", Invited Presentation, Simon Fraser University, November 9, 2001, Burnaby BC Canada

"Issues for Terabit/in^2 Magnetic Data Storage," Invited Presentation, The International Joint Tribology Conference, Sponsored by ASME and STLE, October 1, 2000, Seattle, WA

"The Continuing Revolution in Magnetic Data Storage and Media," NATO's "Advance Studies Institute: Advanced Storage Systems Beyond 2000," June 2000, Rhodes, Greece

"Future Hard Disk Storage: Limits & Potential Solutions," Invited Presentation, The American Physical Society March Meeting, March 20-24, 2000, Minneapolis, MN.

"Logic For Future Magnetic Data Storage Media," Invited Presentation, DISKCON 1999 sponsored by IDEMA (International Disk Drive Equipment and Materials Association), September 1999, San Jose, CA.

"Highly Oriented Advance Data Storage Media," Invited Presentation, Joint Workshop on Advanced Storage Systems, July 22-23, 1999, Singapore.

"Hard Disk Media: Future Problems and Possible Solutions," Invited Presentation, ISSP '99 (The Fifth International Symposium on Sputtering & Plasma Processes), June 15-18, 1999, Kanazawa, Japan.

"Introduction to Magnetic Data Storage," Undergraduate Physics Colloquia, Physics Department, Carnegie Mellon University, April 20, 1999, Pittsburgh, PA.

"Future Directions For Magnetic Data Storage Media," Invited Presentation, International Conference Metallurgical Coatings and Thin Films (ICMCTF99), April 12-15, 1999, San Diego, CA.

"Magnetic Data Storage Density: How Can It Continue to Grow?" Department of Physics and Astronomy Seminar, University of Delaware, Newark, Delaware, December 16, 1998

"Issues, Challenges And Limitations For Future Magnetic Data Storage," Quantum Corporation, Shrewsbury, MA, October 1, 1998.

"Is There a Future for Magnetic Data Storage? " IEEE-Boston Section, Magnetic Society Lecture, Shrewsbury, MA, October 1, 1998.

“Magneto-Optic Data Storage: Some Future Challenges and Limitations”, Keynote Speaker at Optical Storage Symposium, DISKCON Symposium, San Jose, CA, September 22, 1998.

“Microstructure and Orientation in Magnetic Media”, Intevac Users Group Meeting Symposium ‘98, June 19-20, 1998, Silverado Resort, Napa, CA

“Introduction to Magnetic Recording and Hard Disk Magnetic Media,” Research Experiences For Undergraduates Lecture Series, Carnegie Mellon University, June 1, 1998.

“The Challenges and Limitations for Future Magnetic Data Storage Media”, MINT Seminar, University of Minnesota, May 29, 1998.

"The Role and Control of Crystallite Texture, Isolation, and Orientation on Magnetic Media Performance,” MRS 1998 Spring Meeting, Symposium “L, Materials for High-Density Magnetic Recording," San Francisco, April 15, 1998.

Reviewed Publications:

A. Gilad Kusne and David N. Lambeth, " Analytic Assessment of the Significant Emission Area and Integrated Enhancement Factor for Ellipsoidal Electron Field Emitters," IEEE Transactions on Electron Devices, Vol. 57, No. 12, p3491 - 3499, Dec. 2010

A. Gilad Kusne and David N. Lambeth, "Generalized Analytical Solution and Study of Conductive Ellipsoidal Field Emitters," *IEEE Transactions on Electron Devices*, Vol. 57, No. 3 p712-719, Mar 2010.

Bo Li and David N. Lambeth, "Chemical Sensing Of Nanostructured Polythiophene Transistor," *Nano Letters,* Vol. 8, No. 11 p3563-3567, *2008*.

Bo Li, Suresh Santhanam, Lawrence Schultz, et al., "Inkjet Printed Chemical Sensor Array Based On Polythiophene Conductive Polymers," *Sensors and Actuators B*, Vol. 123, 651-660, 2007.

Bo Li, Rui Zhang, Genevieve Sauvé, et al., "Nanostructure Dependence Of Conductive Polymer Chemical Sensors," *Proc. IEEE Sensors 2006*, 843-846, 2006.

Sarah S. Bedair, Bo Li, J. R. Cooper, et al., "A CMOS MEMS Gold Plated Electrode Array For Chemical Vapor Detection," *Proc. IEEE Sensors 2006*, 1074-1077, 2006.

Bo Li, Genevieve Sauvé, Mihaela C. Iovu, Malika Jeffries-EL, Rui Zhang, Jessica Cooper, Suresh Santhanam, Lawrence Schultz, Joseph C. Revelli, Aaron G. Kusne, Tomasz Kowalewski, Jay L. Snyder, Lee E. Weiss, Gary K. Fedder, Richard D. McCullough, and David N. Lambeth, "Volatile Organic Compound Detection using Nanostructured Copolymers," *Nano Letters* Vol. 6, 1598-1602, 2006.

Rui Zhang, Bo Li, Mihaela C. Iovu, Malika Jeffries-EL, Geneviève Sauvé, Jessica Cooper, Shijun Jia, Stephanie Tristram-Nagle, Detlef M. Smilgies, David N. Lambeth, Richard D. McCullough and Tomasz Kowalewski, "Nanostructure Dependence of Field-Effect Mobility in Regioregular Poly(3-hexylthiophene) Thin Film Field Effect Transistors," *J. Am. Chem. Soc.,* Vol. 128 (11), 3480-3481, 2006

Bo Li, S. Santhanam, L. Schultz, M. Jeffries-EL, M. C. Iovu, G. Sauvé, J. Cooper, R. Zhang, J. C. Revelli, A. G. Kusne, T. Kowalewski, L. E. Weiss, R. D. McCullough, G. K. Fedder, J. L. Snyder and D. N. Lambeth, "Volatile Organic Compound Discrimination using Nanostructured Polythiophene Sensors," *IEEE Sensors 2005 Proceedings*, 191-194, 2005

Richard D. McCullough, Genevieve Sauvé, Bo Li, Malika Jeffries-EL, Suresh Santhanam, Lawrence Schultz, Rui Zhang, Mihaela C. Iovu, Jessica Cooper, Prathapan Sreedharan, Joseph C. Revelli, Aaron G. Kusner, Tomasz Kowalewski, Jay L. Snyder, Lee E. Weiss, David N. Lambeth, Gary K. Fedder, "Regioregular Polythiophene Nanowires and Sensors," *Proc. of SPIE.* Vol. 5940*,* 28-34, 2005

Y.-N. Hsu, S. Jeong, D.N. Lambeth and D.E. Laughlin, "Effects Of Ag Underlayer and Pt Intermediate Layer on the Microstructure And Magnetic Properties Of Epitaxial FePt Thin Films," *Journal of Magnetism and Magnetic Materials*, Vol. 260, 282-294, 2003.

Y.-N. Hsu, D. E. Laughlin and D. N. Lambeth, "New Ni_5Al_3 Underlayer for Longitudinal Magnetic Recording Media," *IEEE Transactions on Magnetics*, Vol. 38, 1803-1806, July 2002.

D. N. Lambeth, "Modern Hard Disk Media Issues," *Magnetic Storage Systems Beyond 2000*, Editor George C. Hadjipanayis, Kluwer Academic Publishers, NATO Science Series II. Mathematics, Physics and Chemistry, Vol. 41, 55-74, 2001

Y.-N. Hsu, S. Jeong, D.N. Lambeth and D.E. Laughlin, "Effects Of Ag Underlayers On The Microstructure And Magnetic Properties Of Epitaxial FePt Thin Films," *Journal of Applied Physics* 89(11), 7068-7070, 2001.

B. Bian, W. Yang, D.E. Laughlin and D.N. Lambeth, "Stacking Faults And Their Effect On Magnetocrystalline Anisotropy In Co And Co-Alloy Thin Films," *IEEE Transactions on Magnetics*, Vol. 37, 1456-1458, 2001.

J. Zou, B. Bian, D.E. Laughlin and D.N. Lambeth, "Improving Grain Isolation Of Films Via Grain Boundary Diffusion Of Mn," *IEEE Transactions on Magnetics*, Vol. 37, 1471-1474, 2001.

B. Lu, J. Zou, D.N. Lambeth and D.E. Laughlin, “Stacking Faults in Co-Alloy Longitudinal Media,” *IEEE Transactions on Magnetics*, Vol. 36(5), 2357-2359, 2000.

Y-N. Hsu, S. Jeong, D.N. Lambeth and D.E Laughlin, “In Situ Ordering Of FePt Thin Films By Using Ag/Si And Ag/Mn_3Si/Ag/Si Templates,” *IEEE Transactions on Magnetics*, Vol. 36(5), 2945-2947, 2000.

H. Gong, D. Litvinov, T. J. Klemmer, D. N. Lambeth and J. K. Howard, "Seed Layer Effects On The Magnetoresistive Properties Of NiFe Films," *IEEE Transactions on Magnetics*, Vol. 36(5), 2963-2965, 2000

W. Yang, D.N. Lambeth and D.E. Laughlin, "Dependence Of Co Anisotropy Constants On Temperature, Processing, And Underlayer," *Journal of Applied Physics*, Vol. 87, 2000, 6884-6886.

J. Zou, B. Lu, T. Leonhardt, D.E. Laughlin and D.N. Lambeth, “High Coercivity CoCrPt Films Achieved By Post-Deposition Rapid Thermal Annealing,” *Journal of Applied Physics*, Vol. 87, 2000, 6869-6871.

Y-N. Hsu, D.E. Laughlin and D.N. Lambeth, “Growth Of CoCrTa -Oriented Thin Films On A DO_3 Mn_3Si(002) Underlayer,” *Journal of Applied Physics*, Vol. 87, 2000, pp.6698-6700.

H. Gong, B. Lu, D.E. Laughlin and D.N. Lambeth, “New Highly Oriented Soft Magnetic Underlayer Structures For Perpendicular Recording,” *Journal of Applied Physics*, Vol. 87, 6355-6357, 2000.

B. Lu, S. Bharathulwar, D.E. Laughlin and D. N. Lambeth, “Time And Orientation Dependence Of Ordering In Anodized Aluminum For Self-Organized Magnetic Arrays,” *Journal of Applied Physics*, Vol. 87, 4721-4723, 2000.

D. E. Laughlin, B. Lu, Y.-N. Hsu, J. Zou and D. N. Lambeth, "Microstructural and Crystallographic Aspects of Thin Film Recording Media", *IEEE Transactions on Magnetics*, Vol. 36, no. 1, 2000, pp. 48-53.

A. C. Sheila, T. E. Schlesinger, D. N. Lambeth, "Modeling Mark Edge Jitter in Phase-Change Recording," Proc. SPIE Vol. 4090, p. 116-121; *Optical Data Storage Proceedings*, 14-17 May 2000, 80-82.

D. N. Lambeth, "Hard Disk Media: Future Problems And Possible Solutions," *Vacuum*, Elsevier Science Inc., Vol. 59, p522-530, 2000

D. Litvinov, J.K. Howard, S. Khizroex, H. Gong, D.N. Lambeth, “Reflection High-Energy Electron Diffraction Based Texture Determination: Magnetic Thin Films For Perpendicular Media,” *Journal of Applied Physics*, Vol. 87, 2000, pp. 5693–5695

J. Zou, B. Lu, A.E. Bayer, D.E. Laughlin and D.N. Lambeth, "Crystalline Texture Of CoCrPt Films On CrMn/NiAl And Cr/NiAl Underlayer Structures," *Proc. MRS Symp*. Vol. 577, pp. 593-598; and *Proc. MRS Symp*. Vol. 562, pp. 277-282. 1999

H. Gong, W. Yang, M. Rao, D.E. Laughlin and D.N. Lambeth, "Highly Oriented Co Soft Magnetic Films On Si Substrates," *Proc. MRS Symp*. Vol. 562, pp. 27-32. 1999

H. Gong, W. Yang, D. N. Lambeth and D.E. Laughlin, "Epitaxial Co/NiAl Thin Film Growth On Si Substrates," *Proc. MR*S . Vol. 577, pp. 359-364; *and Proc. MRS Symp*. Vol. 562, pp. 333-338. 1999

J. Zou, B. Lu, D.E. Laughlin and D.N. Lambeth, "The Properties Of CoCrPt/CrMn/NiAl And CoCrPt/Cr/NiAl Films*," IEEE Transactions on Magnetics*, 35(5), 1999, pp. 2661-2663.

H. Gong, W. Yang, M. Rao, D.E. Laughlin and D.N. Lambeth, "Epitaxial Growth Of Quad-Crystal Co-Alloy Magnetic Recording Media," *IEEE Transactions on Magnetics*, 35(5), 1999, pp.2676-2663.

G. Zangari, B. Lu, D. E. Laughlin and D. N. Lambeth, "Structure and Magnetic Properties of Sm-Co Thin Films on Cr/Ag/Si Templates," *Journal of Applied Physics,* Vol. 85 (8), April 15, 1999, pp. 5759-5761

H. Gong, M. Rao, D. E. Laughlin and D. N. Lambeth, "Highly Oriented NiFe Soft Magnetic Films on Si Substrates," *Journal of Applied Physics,* Vol. 85 (8), April 15, 1999, pp. 5750-5752.

W. Yang, D. N. Lambeth and D.E. Laughlin, "Unicrystal Co-alloy Media on Si (110)," *Journal of Applied Physics*, Vol. 85 (8), April 15, 1999, pp. 4723-4725.

H. Gong, D. E. Laughlin and D. N. Lambeth, "Highly Oriented Perpendicular Co-alloy Media on Si (111) Substrates," *Journal of Applied Physics*, Vol. 85 (8), April 15, 1999, pp. 4699-4701.

T. D. Leonhardt, Y. Chen, M. Rao, D. E. Laughlin, D. N. Lambeth and M. H. Kryder, "$CrPt_3$ Thin Film Media for Perpendicular and Magneto-Optical Recording," *Journal of Applied Physics,* Vol. 85 (8), April 15, 1999, pp. 4307-4309.

B. Lu, D. E. Laughlin, S. Z. Wu, R. Ranjan, G. C. Rauch and D. N. Lambeth, "Texture Evolution in CoCrPtTa/Cr/NiAl Magnetic Recording Media," *Journal of Applied Physics,* Vol. 85 (8), April 15, 1999, pp. 4295-4297.

B. Lu, S.D. Harkness, W.A. Lewis, D. E. Laughlin, and D. N. Lambeth, "Lattice Parameter Determination of Textured $Co_{81-x}Cr_{15}Pt_xTa_4$ Films," *Proc. MRS Symp.* Vol. 562, Materials Research Society, Warrendale, PA, 1999.

D. N. Lambeth, W. Yang, H. Gong, D. E. Laughlin, B. Lu, L.-L. Lee, J. Zou and P. S. Harllee, "Magnetic Media Performance: Control Methods for Crystalline Texture and Orientation, presented at MRS Symposium "L", San Francisco, CA, April 15, 1998, Materials Research Society, *Mat. Res. Soc. Symp. Proc.*, 1998, pp. 181-192.

J. Zou, D. E. Laughlin and D. N. Lambeth, "The Effects of Substrate Preheating and Post-deposition Annealing on CrMn/CoCrPt/CrMn/NiAl Films," *Mat. Res. Soc. Symp. Proc.,* Vol. 517, 1998, pp. 217-222.

Y. N. Hsu, D. E. Laughlin and D. N. Lambeth, "Effects of Sputtering Conditions on Texture, Microstructure and Magnetic Properties of the CoCrPt/NiAl Thin Films," *Mat. Res. Soc. Symp. Proc.,* Vol. 517, 1998, pp. 199-204.

H. Gong, W. Yang, D. E. Laughlin and D. N. Lambeth, " Intergranular Coupling and Grain Isolation of Thin Co Films," *Mat. Res. Soc. Symp. Proc.,* Vol. 517, 1998, pp. 223-228.

W. Yang and D. N. Lambeth, "A Simulation of Rotational Hysteresis Energy Loss in Longitudinal Thin-Film Media," *Mat. Res. Soc. Symp. Proc.* Vol. 517, 1998, pp. 285-290.

M. A. Seigler and D. N. Lambeth, “Near-field Magneto-Optic Fiber Probe,” *Mat. Res. Soc. Symp. Proc.*, Vol. 517, 1998, pp. 599-604.

J. Zou, D. E. Laughlin and D. N. Lambeth, "CoCrTa Intermediate Layers for CoCrPt Longitudinal Thin Film Magnetic Media," *IEEE Transactions on Magnetics,* Vol. 34 (4), July 1998, pp. 1582-1584.

H. Gong, W. Yang, D. N. Lambeth, M. Rao and D. E. Laughlin, "Thermal Stability of Ultra-Thin Co Recording Media," *IEEE Transactions on Magnetics,* Vol. 34 (4), July 1998, pp. 1612-1614.

L.-L. Lee, D. E. Laughlin and D. N. Lambeth, "CrMn Underlayers for CoCrPt Thin Film Media," *IEEE Transactions on Magnetics,* Vol. 34 (4), July 1998, pp. 1561-1563.

B. Lu, L. Tang, D.N. Lambeth and D. E. Laughlin, "The Characterization Of Textures Of Thin Films By Electron Diffraction," Proceedings of the International Conference on Grain Growth, ed. H. Weiland, B. Adams and A. Rollett, TMS, Warrendale, PA, June 1998, pp. 529-534.

L.-L. Lee, D. E. Laughlin and D. N. Lambeth, "The Effects Of B2 Structured Underlayers On Thin Film Magnetic Recording Media," *Vacuum*, Elsevier Science Ltd., Holland, Vol. 51 (4), 1998, pp. 703-710.

L.-L. Lee, D. E. Laughlin and D. N. Lambeth, “The Effects of B2 Structured Underlayers on Thin Film Magnetic Recording Media,” Proceedings of the Fourth International Symposium on Sputtering and Plasma Processes (ISSP '97), pp. 79-90.

G. Zangari and D. N. Lambeth, “Porous Aluminum Oxide Templates for Nanometer-Sized Cobalt Arrays,” *IEEE Transactions on Magnetics*, Vol. 33, No. 5, September 1997, pp. 3010-2012.

Y. Chen, W. Yang, D. N. Lambeth and M.. H. Kryder, “Incoherent Rotation in Barium Ferrite Thin Film Recording Media,” *IEEE Transactions on Magnetics*, Vol. 33, No. 5, September 1997, pp. 2998-3000.

W. Yang and D. N. Lambeth, “A Simulation of Rotation Magnetization Processes in Longitudinal Thin-Film Media,” *IEEE Transactions on Magnetics*, Vol. 33, No. 5, September 1997, pp. 2965-2967.

L.-L. Lee, D. E. Laughlin and D. N. Lambeth, "FeAl Underlayers for CoCrPt Thin Film Longitudinal Media," *Journal of Applied Physics*, Vol. 81, No. 8, April 15, 1997, pp. 4366-4368.

D. E. Laughlin, L. Tang, L.-L. Lee, Y.-N. Hsu and D. N. Lambeth, “The Development and Characterization of Crystallographic Texture in Thin Films for Magnetic Recording,” Materials Research Society Proceedings of the Spring 1997 Symposium on Ultrathin Films, Multilayers and Surfaces, Vol. 475, 1997, pp. 107-118.

W. Yang, D. N. Lambeth, L. Tang and D. E. Laughlin, "Epitaxial Ag Templates on Si(001) for Bicrystal CoCrTa Media," *Journal of Applied Physics*, Vol. 81, No. 8, April 15, 1997, pp. 4370-4372.

D. N. Lambeth, D. E. Laughlin, S. Charap, L.-L. Lee, P. Harllee and L. Tang, "Present Status and Future Magnetic Data Storage," *Magnetic Hysteresis in Novel Magnetic Materials*, July 1-12,

1996, George C. Hadjipanayis, Editor, NATO ASI Series E, Applied Sciences, Vol. 338, Kluwer Academic Publishers, The Netherlands, 1997, pp. 767-780.

J. Li, H. C. Cheng, M. J. Kawas, D. N. Lambeth, T. E. Schlesinger and D. D. Stancil, “Electrooptic Wafer Beam Deflector in $LiTaO_3$.” *IEEE Photonics Technology Letters*, Vol. 8, No. 11, November, 1996, pp. 1486-1488.

D. E. Laughlin, L-L. Lee, L. Tang and D. N. Lambeth, “The Control and Characterization of the Crystallographic Texture of Longitudinal Thin Film Recording Media,” *IEEE Transactions on Magnetics*, Vol. 32, No. 5, September, 1996, pp. 3632-3637.

D. E. Laughlin, Y. C. Feng, D. N. Lambeth, L.-L. Lee and L. Tang, "Design And Crystallography Of Multilayered Media," Invited Paper, *Journal of Magnetism and Magnetic Materials* 155 (1996), pp. 146-150.

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"Magnetic Media Structure to Overcome the Thermal Stability Limits," David N. Lambeth, Li-Lien Lee and David E. Laughlin, CMU Technology Transfer Office (97-069), February 8, 1997. A Media design utilizing a new antiferromagnetic structure to provide greater thermal stability to ultra high recording media.

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